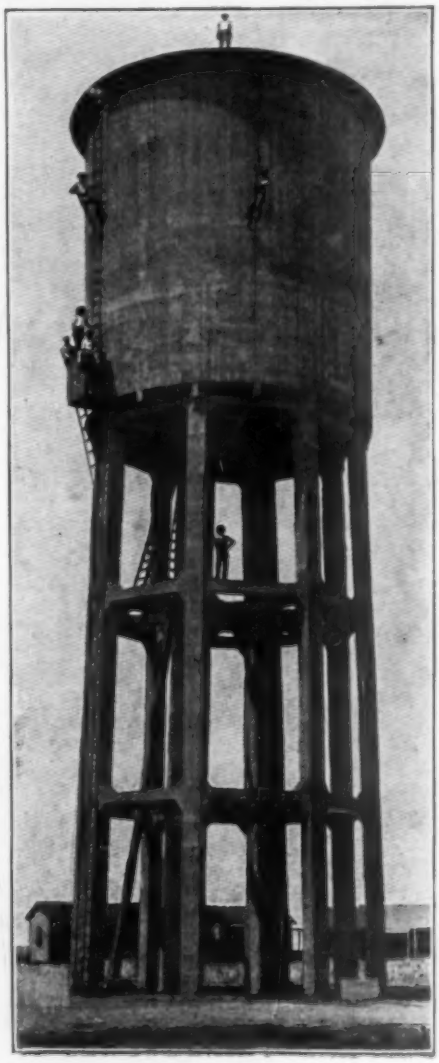
POPULAR MECHANICS

Vol. 10. APRIL, 1908. No. 4.

BIG CONCRETE WATER TANK SUPPORTED ON CONCRETE STRUCTURE

First Structure of the Kind is Completed at Anaheim, Cal.—Height, 112 Feet—Capacity, 200,000 Gallons

The latest daring innovation in reinforced concrete construction is represented by an elevated water tank just completed at Anaheim, Cal. This tank, the first of its kind ever attempted, is 32 ft. in diameter and 38 ft. high, supported on concrete posts 70 ft. high above ground. Its capacity is 200,000 gal. It is made of concrete throughout, reinforced with rings and vertical members of twisted steel. The walls of the tank are but 3 in. thick at the top and 5 in. at the bottom, and absolutely tight. The floor is supported by concrete beams radiating from the center, and the 12 posts, each 16 in. square, are stiffened by two lines of horizontal struts at equal intervals above the base. The foundation of the tower consists of a heavy slab of reinforced concrete extending 4 ft. into the ground. The tank has a conical-shaped roof 2 in. thick, with a cornice, slightly raised to give ventilation for the water within. From the lowest foundation to the extreme top, the height is 112 ft. The cost was $11,400, or 75 per cent of the lowest estimate on a steel tower and tank of same dimensions.



TO DRAIN THE ZUYDER ZEE

Dutch engineers have begun the tremendous task which will result in turning the Zuyder Zee into 1,400 square miles of dry land, protected from the inroads of the sea by great dykes. When this is accomplished, Holland, with its

5,000,000 people living a life of continual strife and watchfulness lest the very land underneath their feet disappear beneath the waves, will have fought and won another battle with its greatest enemy, and justified the motto of the Netherlands, "We Struggle and Emerge."

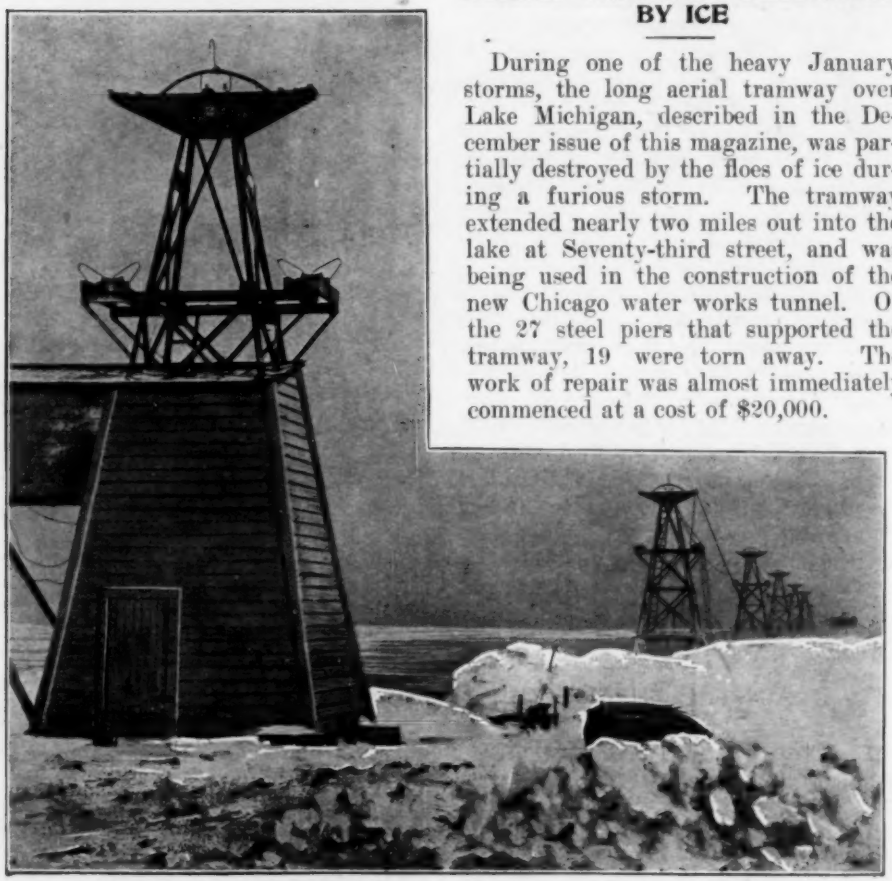
The task is truly a tremendous one and will cost $76,000,000, but when it is completed there will be enough additional homes and farms for 50,000 Dutchmen. The Zuyder Zee has occupied a prominent position in Dutch history. On its shores are the ancient towns under whose walls the Dutch fleets used to lie at anchor in the days when Holland disputed the supremacy of the seas with England.

TEMPERING ARMOR PLATE BY ELECTRICITY

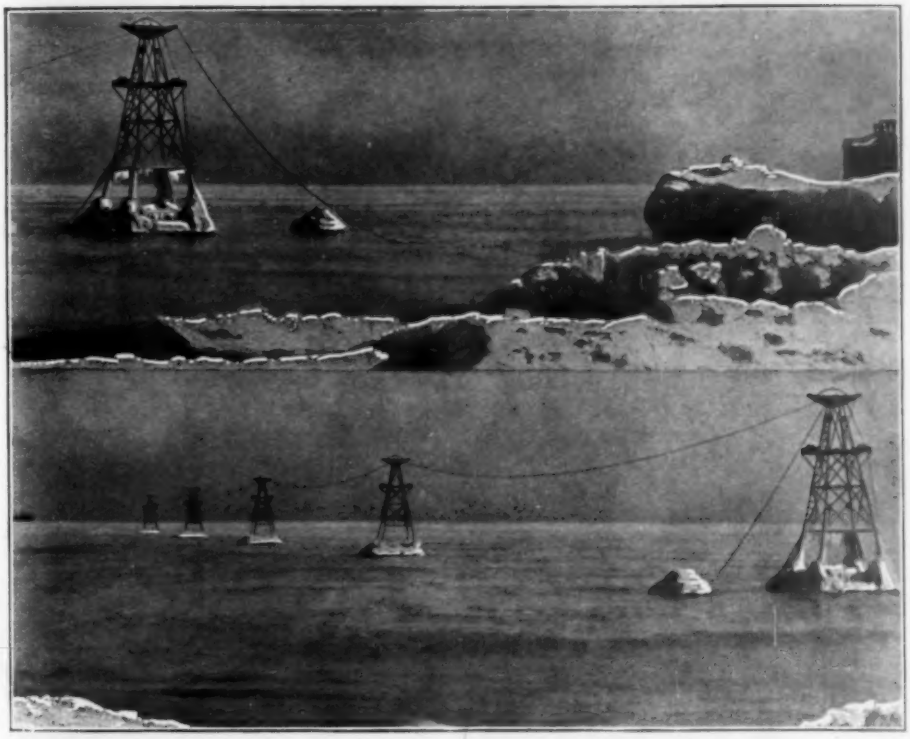
A revolution in tempering armor plate is expected to result from the invention of an American naval officer, which consists of a method of face-hardening by electricity. Carbon is distributed in powdered form over the face of the plate and then electrodes are applied. The carbon works down through the plate to the depth required, or as far as it is heated. Its highest efficiency is on the face of the plate, gradually decreasing toward the center, leaving the inner side of the plate tough and pliable. The old method is the Krupp or Harvey system of annealing.

AERIAL TRAMWAY DESTROYED BY ICE

During one of the heavy January storms, the long aerial tramway over Lake Michigan, described in the December issue of this magazine, was partially destroyed by the floes of ice during a furious storm. The tramway extended nearly two miles out into the lake at Seventy-third street, and was being used in the construction of the new Chicago water works tunnel. Of the 27 steel piers that supported the tramway, 19 were torn away. The work of repair was almost immediately commenced at a cost of $20,000.



Remaining Towers of the Wrecked Aerial Railway

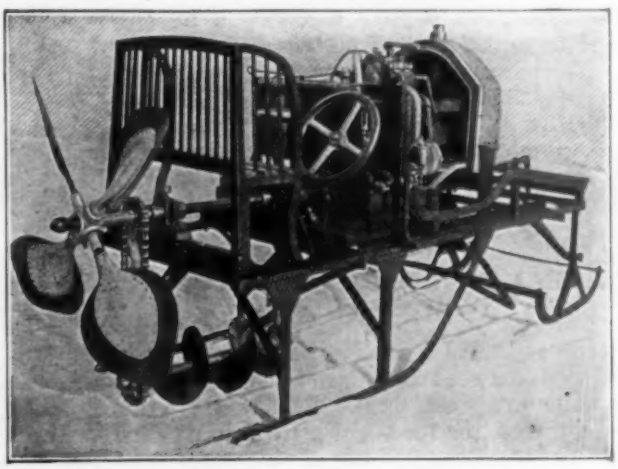


What the Storm Did—Two-Mile Crib at Extreme Left

AN AUTOMOBILE SLEIGH

An engineer of Augsburg, Germany, named Holzhauer, has constructed an automobile sleigh which, under favorable circumstances of roads and wind, attained a speed of 35 miles an hour. The vehicle is built almost entirely of light metal, and for power has a 2¼-hp. gas engine of the usual type.

The propelling medium consists of a 4-bladed aerial screw made of aluminum, the blades being tipped with steel bands, and an Archimedes screw which helps out on hill-climbing. The aerial blades are made spoon-shaped "the better to seize the air," as the inventor says. Steering is accomplished by guiding the forward runners with an ordinary steering wheel and gear. The machine is adapted to operate on roads which are in pretty fair condition.



Steel Sleigh with Aerial Screw

Remarkable Photograph of a Cyclone

CYCLONE PHOTOGRAPH

Nothing is more demoralizing to the nerve of a community than the rapid approach of a big cyclone. The huge funnel, swirling onward like an avenging spirit bent on a mission of destruction, the uncanny blue whiteness of everything, and the absolute cessation of movement in the final lull before the outburst, are calculated to make the most phlegmatic native of a cyclone state scurry like a rabbit to a cyclone cellar or other place of refuge.

This remarkable photograph was taken at Scribner, Neb., in 1902, by E. H. Klemke. The negative is in the collection of George L. Morse, professor of electrical engineering at the University of Nebraska, to whose courtesy we are indebted for the picture.

MAKING INDELIBLE INK FROM TYPEWRITER RIBBON

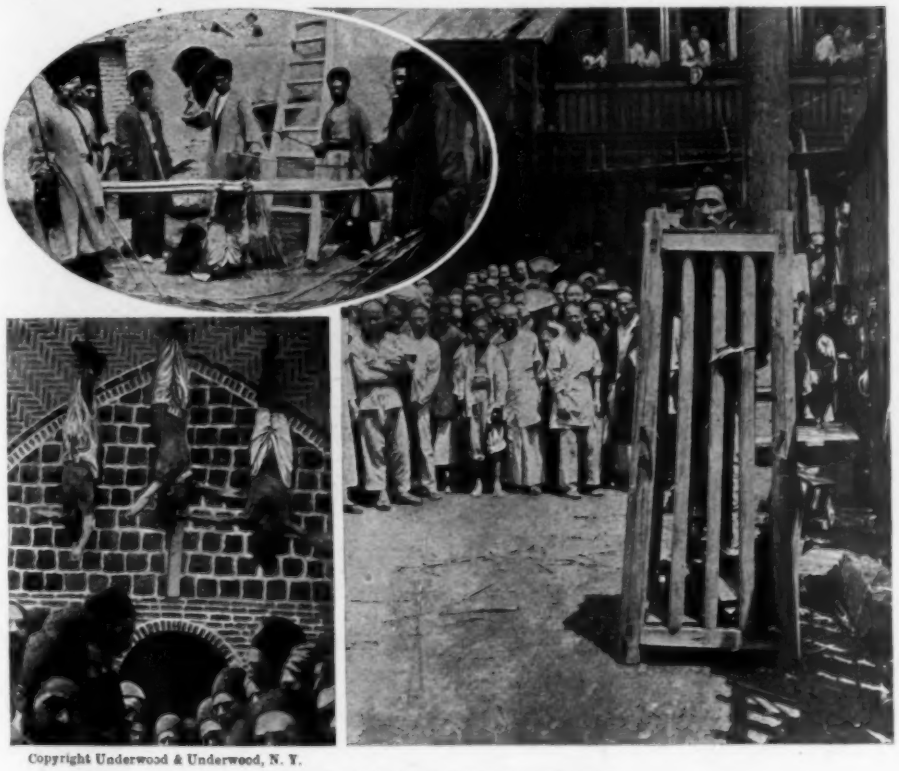
Old and worn typewriter ribbons can be used to a good advantage by making writing ink from them. Remove the ribbon from the spool and place it in a tumbler three-quarters full of water and let soak for 24 hours. Remove the ribbon and pour the fluid into a bottle. This ink will be as good as any indelible ink that may be purchased.

TO TUNNEL CASCADE MOUNTAINS

Reports from the west state that the Great Northern Railway Company is preparing to bore a low-grade tunnel 12 miles long through the Cascades, and that two camps of men are already engaged near Leavenworth, Wash., getting material together to build three large dams in the Wenatchee river to develop power with which drills and machinery are to be operated for the boring of the hole. It is also understood that the Great Northern has arranged for the development of electric power from Chelan Falls for the operation of trains through the present tunnel, and later through the 12-mile bore.

The tunnel project has been openly considered by the Great Northern company for some time and engineers have investigated and approved it. Such a tunnel would give the road the shortest line to Puget Sound and solve the tremendous mountain climb now necessary.

FIENDISH PUNISHMENT OF CRIMINALS



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Three Methods of Oriental Punishment

These illustrations present three ways of punishing criminals in Persia and China, a great contrast to the means adopted for punishment of the same crimes in Christian countries. Two of the photographs are Persian, one showing three robbers suspended by their feet from a wall, and the other the bastinado, a torture inflicted by striking the soles of the feet with whips.

Of China's many death punishments, torture in the cage is the most fiendish. It is reserved for those committing the most atrocious crimes. The criminal is fastened in a cage with planks fitting snugly around his neck and several flat stones are placed under his feet. For six days he has to stand erect on the stones or strangle, while the population view him. If still alive at the end of that time he is placed in an open square and one stone is removed each day until he dies of strangulation.

ELECTRICITY STILL IN PRIMARY STAGE

At a banquet given Feb. 12 by the heads of the departments of the Edison workshops in honor of Thomas A. Edison's 61st birthday, the electrical wizard in a short address made the statement that electricity had not yet been developed beyond its primary stage.

"The possibilities of the development of this great agency are so boundless that we cannot now even comprehend them. I have done little in comparison with what the future holds. Two hundred years from today the

inhabitants of this planet will regard the achievements of the present day in electricity as the mere beginning of a master science."

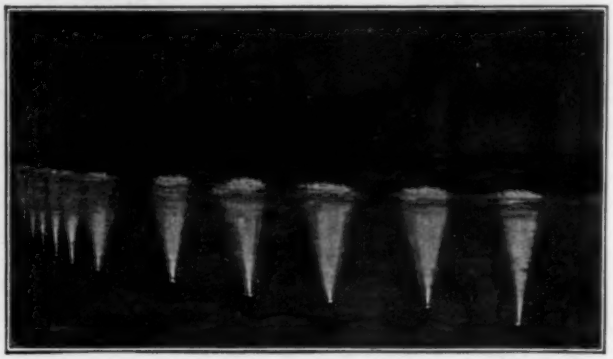
SHIPS MAY BE GUIDED INTO HARBORS ON PATH OF LIGHT

By the use of a system of electric lights beneath the water, recently patented by an American inventor, the navigation of dangerous harbors and waterways may be even safer at night than in the daytime. During the day pilots and charts are necessary; at night, if the system proves all that is claimed for it, pilots, charts and lighthouses can be relegated to the rear and vessels steered in and out over a ribbon-way of illuminated water.

The system consists of a waterproof submarine cable with numerous floating branches connected at suitable intervals, to which are attached incandescent electric lamps fitted with reflectors to concentrate the light into parallel beams. The whole system is designed to withstand the pressure and corrosive action of sea water, and the lamp reflectors are made sufficiently buoyant to maintain an upright position. The cable thus equipped is laid in position in the waterway to be lighted up and connected with a source of electric supply on shore.

The channel can in this way be marked out by brilliantly lighted spots on the surface, and, as of great importance should a city be besieged in time of war, the entire system can be extinguished by the simple movement of a switch on shore. Hostile battleships would then be left with no clear channel marked between the nests of submarine mines that, with such a lighting system in operation, could be banked on each side of the illuminated path. Zigzag the path of light, and destruction would be unavoidable, if the electric current were switched off. As a means of naval ambush, the enemy's ships could be allowed to run part way in, the lights switched off, and they left helpless to advance or retreat.

The system offers equally as good guidance in the densest fog as in perfectly clear weather. Fog and wind practically never occur together, and the beam of light would therefore project from the level surface of the water straight up through the fog. By the use of a water telescope, which is a tube equipped with an observation glass that can be dropped beneath the surface of the water, or by the provision of a bull's-eye inserted in the hull of the vessel below the water line, it would be possible to guide the ship without reference to the surface light.



A Shining Path in Water

THE DRUDGERY OF DRY-LAND ROWING

With the coach holding a watch and counting the time, groups of grinning students as an audience, and a place in the 'varsity boat as their only incentive, aspiring oarsmen are now sweating away in the gymnasiums of the various universities. When the long, narrow racing shells flash through the water in the late spring, the river banks lined with admirers and the course alive with craft, the sight is inspiring

Rowing Practice in Winter

and pretty, but behind it all is the torture the students have to live through before they are even permitted to take their places in the boats.

Every afternoon the aspirants man the make-believe oars of the rowing machines in the gymnasiums and bend their backs in the most monotonous and uninteresting form of training imaginable. There is some incentive in propelling a boat swiftly through the water, in feeling the craft leap to the motion of the waves; but to sit for an hour or two, tugging at oars that simply strain the muscles without any visible result, is almost heart-breaking. It must be gone through with, however, for from the oars in the gymnasium the men step to those that propel the racing craft, and instead of having to become hardened to the toil at the beginning of the season, they tackle the job already broken in and trained.

CABLES ZIGZAG ACROSS OCEAN

The cable lines that look as straight as a transcontinental railway on the map are anything but straight as they lie on the ocean bed. The great Pacific cable, 8,000 miles long, between Vancouver and New Zealand, was time and again deflected from a straight line in order to avoid towering submarine mountains, craters and ground that was otherwise undesirable as a resting place for the cable.

As in building a railway, engineers are first sent out to make a careful survey of the proposed route. With piano wire for sounding lines they determine the level of the ocean bottom, note all obstacles, and secure samples of the solid formations for dissection.

MONUMENTS MARK U. S. BOUNDARY LINE

The United States government has placed granite monuments at intervals along the Mexican frontier to mark the imaginary line that divides the two countries. The steel fence is to protect the monuments from souvenir hunters who even persist in chopping granite to pieces. The tourists shown in the illus-

Standing in Two Countries

Standard Type of English Freight Houses Permitting of Largest Possible Number of Switch Tracks into the Building

tration are standing with one foot in the United States and one in Mexico, a favorite pose at Tia Junia, where the photograph was taken.

SCHOOL IN THE OPEN AIR

A fresh air school, unique among educational institutions in this country, has been opened at Providence, R. I. The only likeness it has in common with an indoor school is that it is in a building, but great swinging windows on three sides of each room, extending the length and width of each, afford an atmosphere of cold, pure air.

Old-fashioned fireplaces have been set in the walls of each room, and in one a large oven has been constructed for the purpose of heating soapstones, which are to be furnished to children with cold feet. The usual custom of removing the outer garments will not be allowed except when the weather compels the closing of the windows. The idea was suggested by the Rhode Island League for the Suppression of Tuberculosis.

REINFORCED CONCRETE HOTEL

This big hotel at San Diego, Cal., is constructed entirely of cast concrete, reinforced in the usual way, and finished with a thin surface coating of cement. The concrete cornice overhangs at least 4 ft. The building will cost $500,000. The architecture is unusually artistic. The structure is of course absolutely fireproof, and is a notable example of the expensive types of construction which are now being erected of concrete.

Hotel of Concrete to Cost $500,000

UNITED STATES SECOND IN SHIPBUILDING

The shipbuilding summary of the world for 1907 shows that the United States ranks second for the year in total tonnage and ships constructed, the figure being 488,059 tons. England comes first with 1,673,121 tons, nearly four times as much. Germany is third with 292,073 tons. Japan is fourth and France fifth, the former having to its credit 122,095 tons.

SUBMARINES ON WAY TO PACIFIC

The United States submarine boats "Porpoise" and "Shark" are on their way to the Pacific coast snugly packed away in a collier. They weigh not more than 60 tons each, and no serious difficulty is expected in transporting them around South America. The little war machines will be stationed at San Francisco.

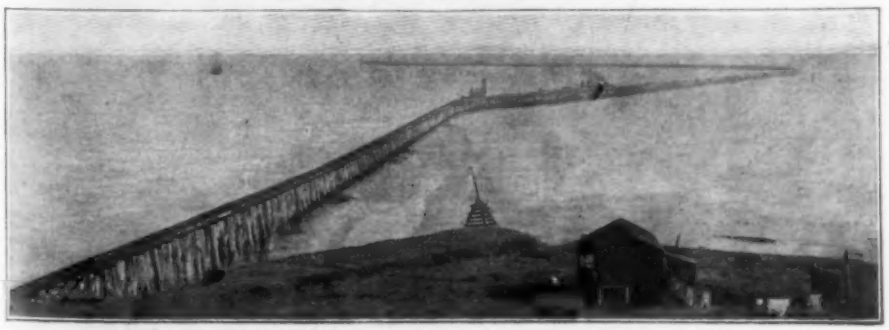
LONGEST OCEAN BREAKWATER IN AMERICA

In the construction of the new harbor at San Pedro, Cal., the government is building a breakwater that extends two miles out into the open sea. Piling was first driven, on which a railway trestle was built, and immense quantities of rock are being dumped on both sides of it. The foreground is government land and will probably be the site of a fort before many years.

TRENCH FOR WATERWORKS DAM

The Trench is 150 Ft. Deep

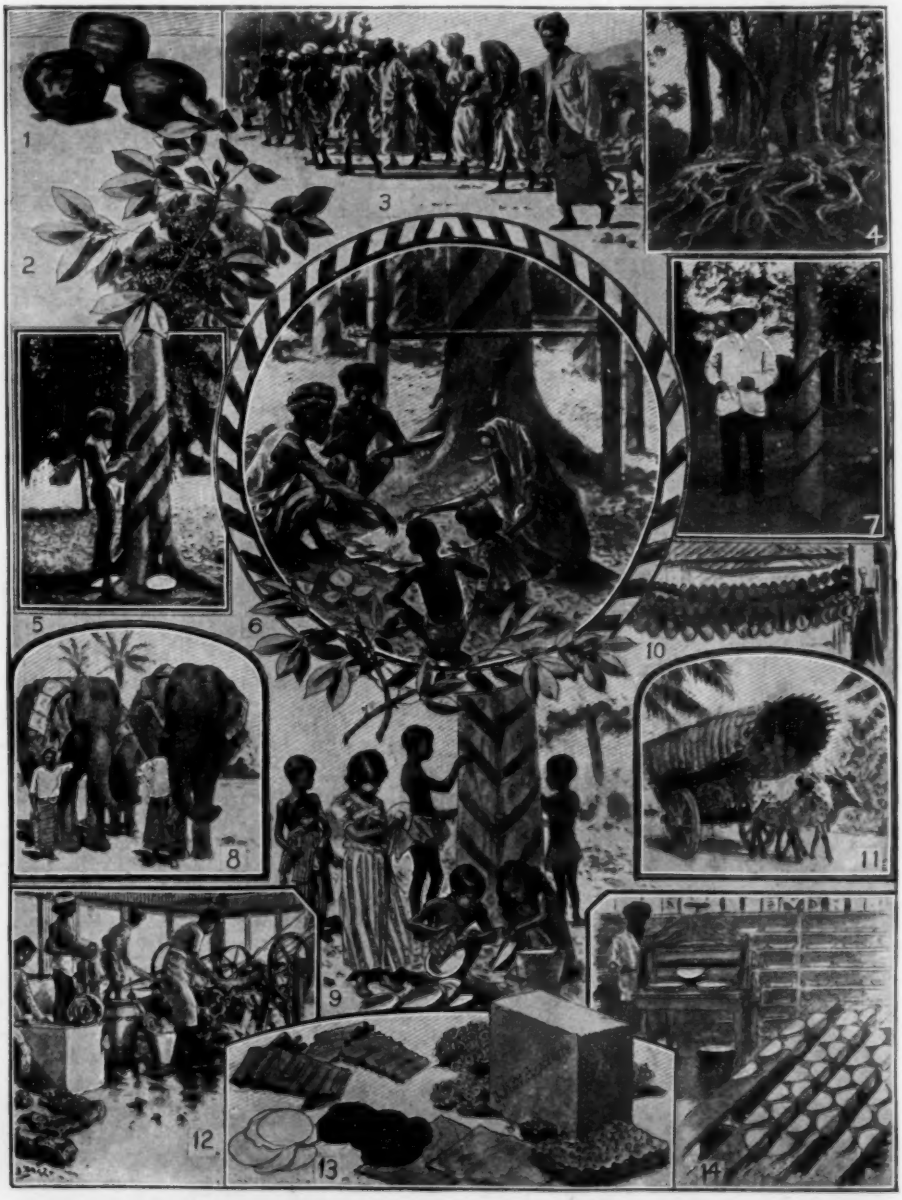
This immense trench is being excavated across the valley at Angram, England, for the construction of a dam to collect the water that comes down from the mountains and convert it into a supply for Bradford. The main trench is 400 ft. wide and 150 ft. deep. The work will take 8 years; cost, $2,500,000.



This Breakwater Extends Two Miles Out Into the Sea

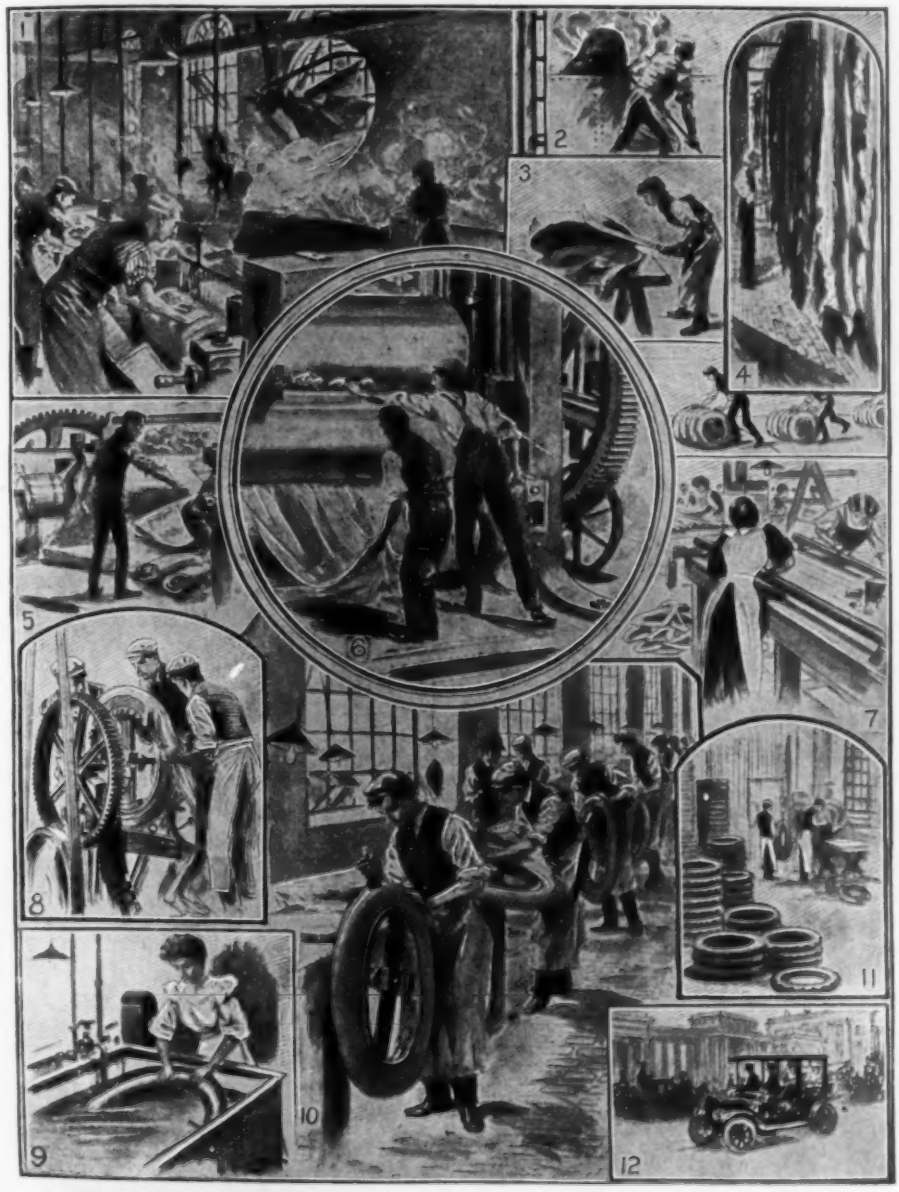
EVOLUTION OF RUBBER FROM SEED TO AUTO TIRES

These two sets of illustrations form a picture story of a piece of rubber from the moment of its inception in the seed until it is turned out at an automobile factory in the form of tires. The first group shows the method of harvesting



1—Seeds of rubber; 2—Rubber blossom; 3—Tamil coolies and foreman on way to work; 4—Rubber tree in Colombo; 5—How the bark is cut; 6—Serving rice on a palm leaf at dinner time; 7—Spiral cuts on tree; 8—Elephants used for transporting rubber on one plantation; 9—Children at work; 10—Rubber biscuit drying; 11—The usual mode of transportation; 12—Machine for making crape rubber; 13—Different forms of rubber ready for shipment; 14—Rubber biscuits ready for drying.

rubber in Ceylon. The trees are tapped and drip-tins are placed below the cuts to catch the sap as it exudes. When it has sufficiently thickened it is rolled into cakes, and then cast into blocks for market. The second group shows how the raw rubber is worked into form and finally turned out as tires. Illustrations used by courtesy of London Illustrated News.



1—Washing raw rubber; 2—An unusually large lump; 3—Carving a rubber joint; 4—Pure rubber drying in sheets; 5—Mixing or compounding machine; 6—Calendering machine; 7—Rubber-tube making for auto tires; 8—Making canvas casing for auto tires; 9—Testing tubes for leakage; 10—Rubbering auto tire casings; 11—Finished tires weighed and checked into stores; 12—The finished article.

AUTOMOBILES EQUIPPED WITH WIRELESS TELEGRAPH

An automobile equipped with a wireless telegraph apparatus was recently

Army Wireless Auto

shown at a Brussels exhibition, and although the tall mast fitted on top of the limousine would doubtless be an unsurmountable inconvenience to touring, such an equipment is now being used in army operations and is found to be satisfactory.

A number of armored automobiles, thus equipped, and placed with the different divisions of a warring army, would make the transmission of orders vastly superior to the ordinary field telegraph service, providing, of course, that the opposing army could not catch the orders with a similar apparatus.

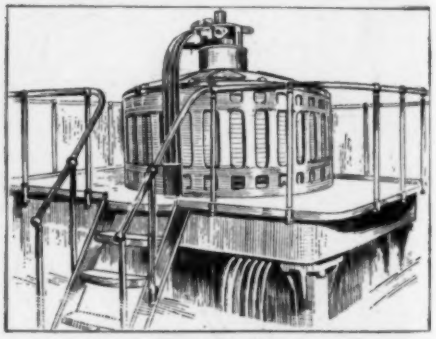
FIRST AMERICAN TAXIMETER

This illustration shows a cab taximeter recently invented in America. It has a circular dial 7 in. in diameter and 4 in. thick. Three sets of indicators are made on the dial, the first giving the number of persons riding, the second automatically marking up the charges as the ride continues, and the third making note of the extra charges for trunks, etc., which is also included in the second, or "total fare," indicator. The "vacant" sign is turned down when the trip starts.

25,000,000-GALLON ELECTRIC PUMP

An electrically-driven centrifugal pump, operated by power from Niagara Falls, is in active service in the municipal pumping plant at Buffalo, N. Y. The pump is of vertical shaft construction and is direct coupled to a 1,500-hp. induction motor, operating at a speed of 500 revolutions per minute. The pump's capacity is 25,000,000 gal. of water a day.

The illustration shows the design of



Niagara Pumps Buffalo Water

the vertical electric motor mounted on a platform above the pump. It has one step-bearing and two guide bearings, the former consisting of two plates between which the oil is forced. The weight of the motor is partially carried by the incoming water acting on the suction side of the pump, and the remainder by a film of oil, so that the friction losses are minimized. Forced lubrication is also used for the guide bearings.

A London physician has recently operated with the knife for consumption. An opening was made in the patient's back and the diseased part of the lung removed.

SMALLEST AND MOST DEADLY MACHINE GUN

Maxim's latest invention is a machine gun so powerful that from its small muzzle bursts a hailstorm of 8,000 shot every 15 minutes, and so small and delicate that it can be easily carried on the backs of three soldiers. Rocky passes can be climbed, and the awful new instruments of death set up in a sheltered position from which the ranks of the enemy could be mowed down like grain before a reaping machine. The power of 3,000 men armed with 1,000 of these machines can hardly be estimated. Disarmament is not the only way to insure peace.

Fires 600 Shots a Minute

The machine is of wonderful design and lightness. The three soldiers to which it is apportioned are provided with a special harness of leather straps and pads for the pieces to rest upon. The first soldier carries the barrel and chamber, the second the tripod or stand, and the third the ammunition case, containing bands of cartridges. A few moments suffices to put the parts together. By the pressure of a lever the firing commences and either grape shot or bullets are discharged at a speed of between 500 and 600 shots a minute.

GREATEST WATER THOROUGHFARE IN THE WORLD

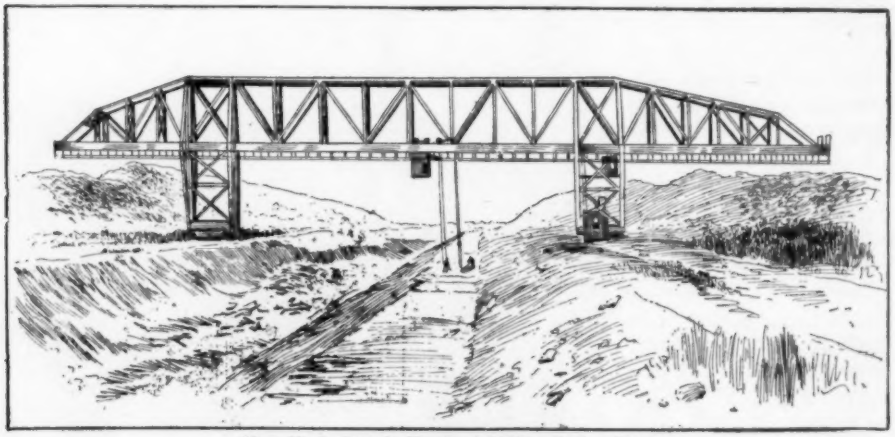
The St. Clair river, connecting Lake Huron and Lake St. Clair, is the greatest water thoroughfare in the world, according to the figures compiled at the close of the navigation season of 1907. During that season 23,721 vessels, with a tonnage of 48,958,328, passed through this river. The merchandise traffic amounted to 67,292,504 net tons, of which 46,966,193 tons represented iron ore, lumber and grain from the northwest southbound for Buffalo and other Lake Erie ports. The northbound traffic represented 20,326,311 net tons, of which 18,427,121 tons was coal from the mines of Ohio, Pennsylvania and West Virginia.

GIRLS TAUGHT LIFE-SAVING

A course in life-saving has been instituted among the women students of Columbia University for the purpose of making them as adept as men in rescuing drowning persons. They receive the regular life-saving drill, including the grips and breaks, towing to shore and artificial respiration. A fully dressed girl is thrown into the water at one end of the swimming tank and other girls are obliged to rescue her from the opposite end and take her back, which is already done in 57 seconds. This new departure in co-education has become immensely popular.

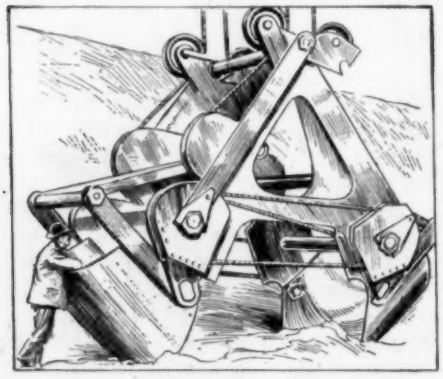
EXCAVATOR DOES WORK OF 800 MEN

A new type of excavator is being used with great success on a canal contract just west of Rochester, N. Y., where a prism 35 ft. deep is being excavated through earth and rock, in connection with the enlargement of the canals of the state, for which $101,000,000 was appropriated four years ago by a referendum vote of the people.



New York State's Hundred Million Dollar Ditch

The structure, designed by the contractors and built at a cost of $175,000, is 428 ft. long and 92 ft. wide. It is operated by electricity derived from an electric light plant some miles distant. In the car suspended underneath the bridge is the operator and machine which lowers and hoists the clam-shell bucket, carries it to either end of the bridge, and moves the entire structure either way.



The Bucket Weighs 22 Tons

The rock at this point is of hard Lockport dolomite. It is first drilled, and then blown up by light charges of dynamite. It breaks loose in large slabs about 5 in. thick. The bucket takes a huge bite of rock and drops it on the spoil banks. The bucket weighs 22 tons, has a capacity of 8 cu. yd., and makes a round trip in one minute. It is estimated that the excavator does the work of 700 or 800 men.

AERIAL LETTER BOXES

Aerial letter boxes have been placed in all large tenement houses and apartment buildings in Budapest, Hungary. When the postman enters the hall on the first floor of a building he places the letters in the boxes allotted to the different families. A spring is then pressed and electricity does the rest. The boxes are shot up to the floor required, where they remain until emptied, or until the postman comes again and brings them down by touching another spring.

By a vote of miners and mine officials it was decided to adopt fulminite powder as an explosive in the Hazel mine at Canonsburg, Pa., the belief being that this explosive is much less liable to cause explosions of gas than the powder formerly used.

UNITED STATES WILL STRIVE FOR AIRSHIP SUPREMACY

Yankee Ingenuity Demanded to Construct Heavier-Than-Air Flying-Machine--Must Fly 40 Miles an Hour and Stay in Air That Length of Time

By Francis M. Buzzell.

[Editor's Note—It is impossible to illustrate the machines accepted, as the government refuses to allow the plans to be made public at present.]

As the present has solved the problem of the dirigible airship, the near future will undoubtedly solve the problem of flight by heavier-than-air flying-machines, and that near future, if the United States of America gains its demands, is only a few months distant.

Ever since the first heavier-than-air flying-machine took its first leap into the atmosphere and succeeded in gliding for a few seconds before sinking back to earth again like a bird with a broken wing, enthusiastic aeronauts have labored and risked their lives in trying to imitate the birds. In first attempts everything went up in the air but the flying-machines, but gradually the aeronauts have become more familiar with the science of aero-dynamics, until at the present day successful flights of considerable distance have been made.

France was the first nation to take a serious interest in aerial navigation. Germany and England soon followed, but the United States government continued to play with a few spherical balloons until American airship inventors began to despair of government co-operation.

Now, however, the United States has taken an initiative that has caused more than one aspiring aeronaut to wonder whether Missouri is part of the United States or the United States part of Missouri. "Show me!" it says, and in such a manner as to prove beyond doubt whether the problem of aerial flight by airships heavier than air is solved or still in the solving.

On Dec. 23, 1907, the United States government, through the Signal Corps of the War Department, sent out advertisements and specifications for a heavier-than-air flying-machine. Every aeronaut who believed he could solve the problem of such flight was eligible to submit his proposal on or before Feb. 1, the government reserving the right to reject any and all proposals. During that period the office of Gen. James Allen was literally swamped with letters from every part of the country, serious and otherwise. At noon, Feb. 1, 41 bids had been received. Of this number the Board of Ordnance and Fortification only found three showing enough serious thought and practical ability on the part of the inventor to warrant recommendation. These three were tentatively accepted by the war department. The trials will be held at Fort Myer, Virginia, in July and August. The successful bidders are as follows: J. F. Scott, Chicago; A. M. Harrington, New York; Wright Bros., Dayton, O. The machines of the first two are to be delivered by July 10 and the third by July 20.

In reading the requirements it is easy to see why the aeronauts have raised the question of the United States and Missouri. European countries, as before stated, have lent their aid to solve the problem of aerial flight and made demands on the ingenuity of airship inventors, but it remained for the United States to demand, not a successful flight of a mile, and a few minutes spent in air, but a machine capable of carrying sufficient fuel for a flight of 125 miles, and able to stay in the air at least one hour in the trial tests.

The requirements are as follows:

The flying-machine must be designed

so that it may be quickly and easily assembled and taken apart for transportation in an army wagon. No more than an hour should be required to take it from wagon and prepare it for flight.

It must be able to carry two persons having a combined weight of 350 lb., and a sufficient fuel supply for a flight of 125 miles.

It should have a speed of at least 40 miles an hour. Less than 36 miles an hour will be rejected. Before acceptance, a trial endurance flight will be required of at least one hour, during which time it must remain continuously in the air without landing, be steered in all directions without difficulty, and be at all times under perfect control and equilibrium.

It must be so designed as to ascend in any country which may be encountered in field service; the starting device must be simple and transportable, and it must be able to land in a field without a specially prepared spot and without damaging its structure. It is also to be provided with some kind of a device to permit of a safe descent in case of an accident to the propelling machinery.

The speed accomplished during the trial flights will be determined by taking an average of the time over a measured course of over 5 miles, with and against the wind. In the trial flights the machine will make a flying start, crossing the starting line at full speed. All tests must be completed within a period of 30 days from the date of delivery to the government. Three trials will be allowed for speed and three for endurance.

Bidders must furnish evidence that the government has the lawful right to use all patented devices which may be part of the flying-machines and that the manufacturers are authorized to convey the same to the government. This refers to the unrestricted right of the government to use the machine, but does not mean the exclusive purchase of patent rights for its duplication.

The United States has thus placed the standard of success at the highest point, and it now remains for Yankee ingenuity to meet this demand with at least one heavier-than-air flying-machine that will embody all the requirements. Whether this is at present possible or not has yet to be proved, but if the requirements are met with the successful inventor will have solved the problem.

Even before the government commenced advertising for bidders to present their plans for heavier-than-air flying-machines, notifications were sent broadcast through the country requesting the presentation for approval of plans and bids for the construction of dirigible airships. The time limit for the receipt of these bids closed Jan. 15, and they are being examined for acceptance along with the others. The trials for the two styles of aerial craft will be held at Fort Myer at the same time.

The specifications for the dirigible balloons call for a speed of 20 miles an hour in still air by a ship not longer than 120 ft., but capable of carrying two men having a combined weight of 250 lb., and at least 100 lb. of ballast, which is to be used as a compensation for increased weight when the balloon is operating in the rain. Enough fuel must be carried for a continuous operation of the engine for at least two hours, determined by a trial endurance flight, the airship traveling continuously at an average speed of at least 70 per cent of that which it accomplishes during the trial for speed. The engine must have suitable cooling arrangements to insure that no excessive heating will occur.

The scheme for ascending, descending and maintaining perfect equilibrium must be regulated by shifting weights, movable planes, or by other approved methods. Balancing by the aeronaut changing his position in the car will not be accepted. The gas bag must be inflated with hydrogen, but its dimensions and shape are left to the inventor, excepting length.

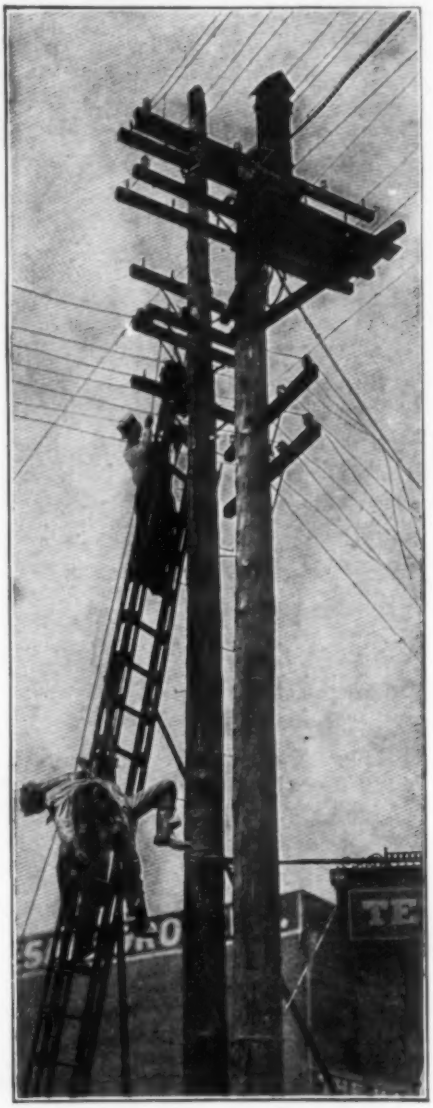
As is seen by these specifications, the dirigible airships must be also of a high

standard of excellence, but the problem of aerial navigation with this style of aerial craft has been solved, while with the heavier-than-air type the beginning has hardly been reached. Therefore the greatest interest of the future will be centered around the style of craft that really flies, not floats. The greatest aeronautic experts in the world say that the ultimate solution of aerial navigation rests with the heavier-than-air flying-machine, and that the dirigible balloon, with its many limitations, is simply the stepping stone to greater aerial triumphs. "If man would fly, let him imitate the bird," says Santos Dumont.

THRILLING PARACHUTE LEAP

The world must be amused and thrilled, and every year the "thrillers" must be new and more exciting than the preceding one. Among the latest "thrillers" is the triple parachute leap, in

which one aeronaut uses three different parachutes before reaching earth. He leaves the balloon in his downward flight with a red parachute, but after falling a short distance liberates it and makes a second plunge through space with a white parachute. This feat is repeated again after another drop, and he finally lands with a blue parachute. Another "thriller" is a double parachute leap from the same balloon, in which a man and woman race to earth in parachutes which fall five or six hundred feet before opening out.



This photograph shows a victim of a live wire being taken down from a pole at El Paso, Tex. It was found necessary to call out the fire department to remove the body. Photo by "The Humphries Co."

Spain will expend $80,000,000 on a fleet of warships to be built on the Clyde.

DOUBLE-DECKED WATER TOWER

The smaller tank raised high above the main tank of this water tower, in

High Tank for Fire Pressure

the Colorado desert, constitutes the fire protection of a railroad hotel near by. The added water pressure thus gained is sufficient to throw a stream of water a considerable distance.

OLD MONITOR AS TARGET

The double-turreted monitor "Florida" is to be made the target of the 12-in. guns of one of the big battleships of the U. S. navy. It is not the purpose to destroy the monitor altogether, but to direct the gunfire against one of the turrets, to determine the effect of actual gunfire upon the controlling machinery of a ship.

Prince Henry, brother of the German Kaiser, has joined the Berlin airship club.

NEW YORK TO PARIS AUTOMOBILE RACE

United States Presents Polar Aspect to Contestants—Cars Struggle Through Snowdrifts as High as a House

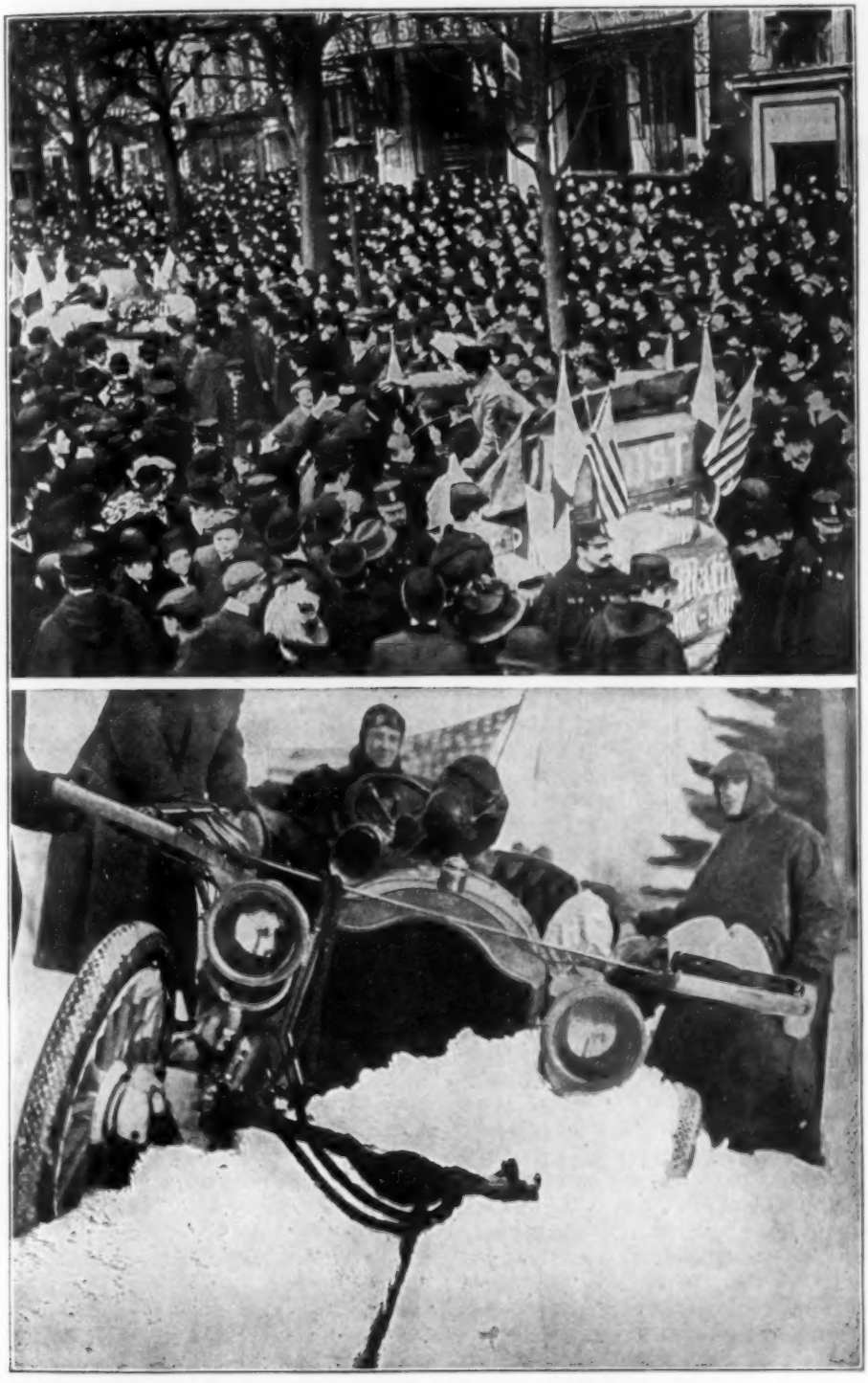
The six automobiles which started from New York on February 12 on the first lap of the 20,000-mile race to Paris, three-quarters around the world, by way of Chicago, San Francisco, Alaska and Siberia, met with difficulties before reaching Chicago, in comparison with which the trip across Alaska and Siberia, so some of the contestants believe, will be easy.

Of the six cars entered, only one, the Thomas Flyer, driven by Montague Roberts, flies the American flag. The other cars are the De Dion, French, driven by M. St. Chaffray; Motobloc, French, driven by M. Goddard; Sizaire-Naudin, French, M. Pons; Brixia-Zust, Italian, Antonio Scarfoglio; Protos, German, Lieutenant Koeppen.

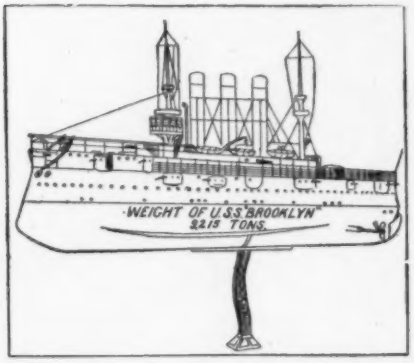
Montague Roberts and the American car took the lead soon after leaving New York and ran into Chicago during the last week of February, still in the lead. Through the worst blizzard of the winter, the American car bucked snowdrift after snowdrift, breaking the path through hundreds of miles of snow-blocked roads. Where the roads were absolutely impassable, railroad tracks were straddled and the car pumped its way over the ties. In two instances deep gullies were crossed on narrow electric railway trestles. The French and Italian cars were still fighting their way through the snowdrifts of Indiana when the American entry reached Chicago.

One of the illustrations shows the American car bucking the Indiana snowdrifts, and the other is a scene in Paris just before the French and Italian cars started for America.

Orders have been posted in the shops of the Pennsylvania railway system prohibiting swearing among the men while at work. The penalty will be an enforced vacation.



Paris Gives a Warm Send-Off--Indiana a Cold Reception



The steel girder which broke and caused the fall of the Quebec bridge was supposed to stand a load of over 9,000 tons, or a load equal to the entire weight of a big battleship. Imagine a single girder holding up the battleship "Brooklyn," which weighs 9,215 tons, and you have the load the broken girder was expected to carry.

STILL IMPOSSIBLE TO RESTORE TONE OF CRACKED BELLS

Every attempt so far made to restore the tone of cracked bells has proved unsuccessful. In many instances the cracks have been filed and sawed out and hot bell metal has been poured in, but the results have been the same. Bell metal is an alloy composed of 75 per cent copper and 25 per cent tin.

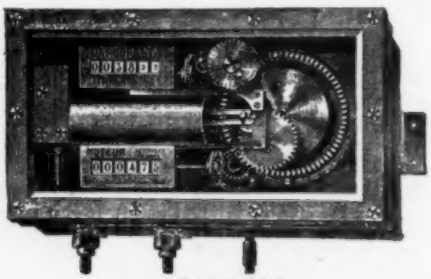
"The only way the tone of a cracked bell can be restored is by recasting it," says the manager of the McShane Bell Company. "There have been any number of experiments made by those claiming to restore the tone in various ways, but these experiments have never been successful."

The same assertion is made by Chester Meneely, of the Meneely Bell Company, who says that the hot bell metal will not fuse properly and the cracks appear after a few blows have been struck with the hammer.

Undoubtedly a way will be discovered some day by which the tone of a cracked bell may be restored. To successfully solve this problem will fill a long-felt desire. There are historic bells in existence for which countries or societies would pay hundreds of dollars to have successfully mended and the tone restored. The great American Liberty Bell is one instance, and the old Spanish mission bell at Anaheim, Cal., another. It was only a couple of years ago that it was thought impossible to braze cast iron, but it is now an accomplished fact, and the process may eventually prove successful in repairing bells.

GASOLINE METERS FOR AUTOMOBILES

Among many other schemes devised for the purpose of keeping an accurate account of the movement, or lack of movement, of the different parts and accessories of automobiles is a meter for measuring the amount of gasoline



A French Idea

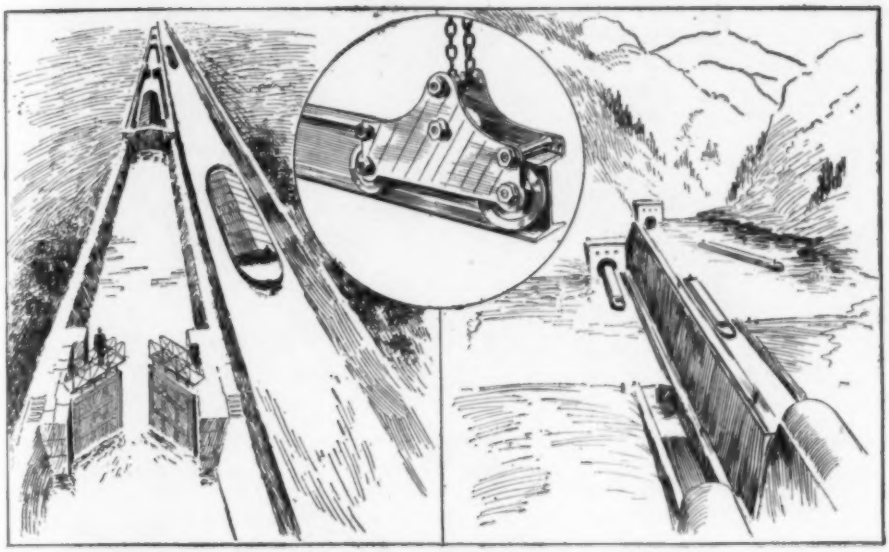
consumed by the engine at different speeds. The upper dial shows the amount of gasoline used and the lower one indicates the revolutions of the motor in hundreds.

RUNAWAY ENGINE WRECKS 30 CARS

A runaway Buffalo and Susquehanna locomotive broke away from its train and ran wild for a distance of 15 miles, killing one man, injuring several more and completely wrecking a freight train of 30 cars, which stopped its mad flight. The cause of the runaway is believed to have been a defective spring, which allowed the throttle to slip several notches and let in a full head of steam.

American automobiles sold in 1907 brought $105,000,000.

TO CLIMB THE ALPS WITH BOATS



Proposed Method for Floating Boats Over Mountains

An Italian engineer named Signor Caminada proposes to connect Genoa with Lake Constance and float barges over the Appennines and the Alps by a ship canal project more stupendous and seemingly more impracticable than the wildest dreams of imaginative and unpractical brains. Yet Europe is impressed, and the scheme has won the support of the famous engineer, Senator Columbo, president of the Polytechnic of Lombardy. At first view the idea is startling enough to make the most sanguine thinkers become skeptical, but as it unfolds and takes shape possibilities present themselves which are worthy of more serious consideration.

Signor Caminada's scheme is to construct what might be called a water ladder over the mountains with a long series of locks and canals. The canal is composed of two parallel tubes or channels, one of which is for barges running down the mountains and the other for barges climbing over. In the locks the barges are raised and advanced by the power of incoming water, the vessels being kept straight by two sheaves running on rails above and below. When the canal has to pass through a mountain it runs in two tunnels inclined in opposite directions. The key of the scheme is the fact that the water descends in both tubes, but crosses from one to the other alternately, so that when a barge descends with the sinking water in one tube, another barge is rising with the same water, which necessarily rises in the lower section of the other. Further water from the main reservoir carries the ascending barge to the top, and the descending boat enters the next tubular section. The canals will be constructed of masonry and closed with iron gates. The cost of such a scheme is estimated at $300,000,000.

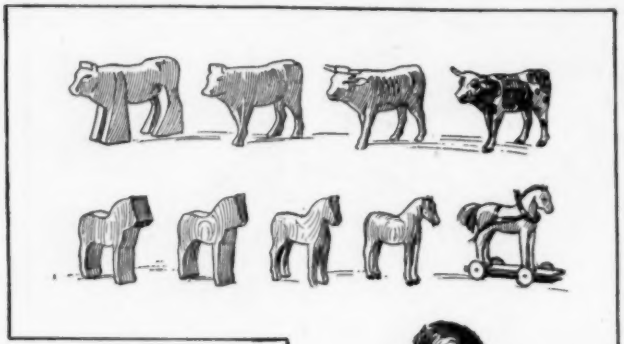
1. The running sheave and rail to keep the barges in a direct course through the locks.

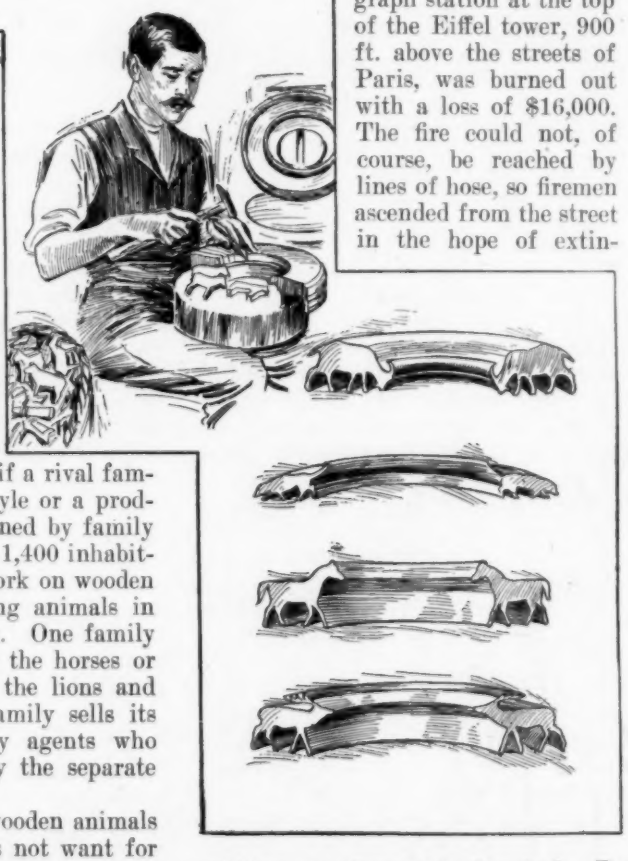
2. Canals with sloping bottoms, the upward passage divided into locks, the downward passage free for descending barges.

3. The ends of a mountain tunnel with its supply basins and boats ascending and descending.

MAKING THE FAMOUS TOYS OF NUREMBERG

One of the quaintest industries of Germany is the manufacture of wooden toys which has been carried on for centuries by the famous toymakers of Nuremberg, and its environs at the edge of the Black Forest.





Today, as in past years, the homes of the toymakers are their shops, and each family works by itself. Not only every village but every family has its specialty, forming a veritable monopoly, curious from an economic standpoint. Each village and each family withholds the right to manufacture its specialty, and if a rival family or village usurps a style or a product, this right is maintained by family or village disputes. The 1,400 inhabitants of Seiffen live by work on wooden toys, their specialty being animals in pens and the Noah's ark. One family makes the cows, another the horses or goats, and still another the lions and elephants, etc. Each family sells its products directly to toy agents who come periodically to buy the separate pieces.

The manufacture of wooden animals is quite simple, but does not want for ingenuity. The work starts with a specially prepared circle or wheel of white wood, which is turned and grooved to make the outline of a pony, horse or deer. The toymakers slice these wheels as a loaf of bread is sliced. The roughly outlined pieces then pass into other hands in the family and by stages are gradually brought to a finished state.

HIGHEST BLAZE ON RECORD

What was undoubtedly one of the highest fires in the world's history occurred recently when the wireless telegraph station at the top of the Eiffel tower, 900 ft. above the streets of Paris, was burned out with a loss of $16,000. The fire could not, of course, be reached by lines of hose, so firemen ascended from the street in the hope of extinguishing the blaze with chemicals. By the time they reached the top the delicate apparatus had been ruined. New instruments will be installed.

NEW YORK-HOBOKEN TUNNEL COMPLETED

Section of Tunnel ∴ An All-Steel Car ∴ Vaulted Roof at Stations

The first section of the $70,000,000 system of tunnels connecting New Jersey with New York was opened February 25. It is the first tunnel for passenger traffic under the Hudson river and forecasts the doom of the Hudson ferries. The opening was celebrated by officials of the two states, the nation, and thousands of commuters, who no longer have their coming and going dependent upon fog, ice, and ferry delays.

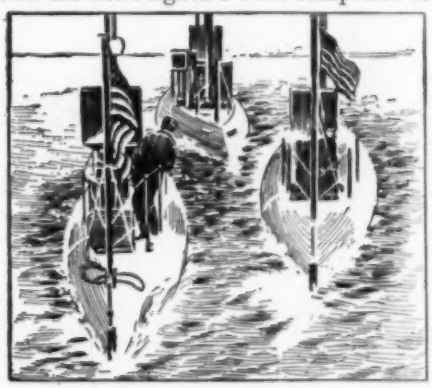
The two tubes of the tunnel are separated by a thick wall, each being an individual cylinder. The trains, as they rush through, act as pistons and draw in with them fresh air from the stations.

The cars are of a new type, constructed of steel, with concrete floors. They have three big doors on each side and one at either end, all controlled by compressed air. The motormen cannot start the trains until they receive a flash signal from the guards, and the flash signal cannot be sent until every door in every car is completely closed, insuring safety to passengers. The seats run along the side and accommodate 100 passengers.

The ceilings of the stations are vaulted, the lights bringing out an effect which is restful to the eyes. At the stations the trains run in between two platforms. On one of these the passengers alight, while from the other the cars are entered. The trip from Fourteenth street and Sixth avenue, New York, to Hoboken is made in 10 minutes.

SUBMARINE SQUADRON ON CRUISE

The United States submarine boats "Cuttlefish," "Viper" and "Tarantula" have been making a cruise from New York harbor to Hampton Roads, the longest trip of the kind ever made by boats of their class. The first start was interfered with by great quantities of floating ice in lower New York bay, and the little fighters were compelled to

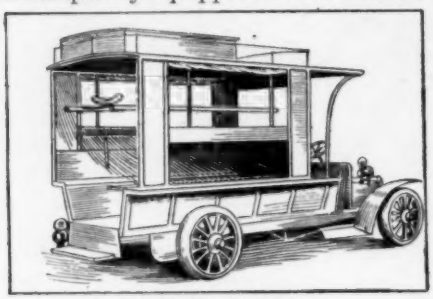


On a Long "Hike"

return to the Brooklyn navy yard, all of them more or less injured, rudders and propeller blades being bent. Rumor places their destination as Manila Bay.

PARIS AUTOMOBILE AMBULANCE

This automobile ambulance is one of a number of types in use in Paris. It is completely equipped for the comfort



French Hospital Auto

and care of patients of every description. The sides are curtained instead of being solid, and can be rolled up when more than the usual amount of fresh air is desired. The box on the roof is filled with surplus bedding and hospital necessities.

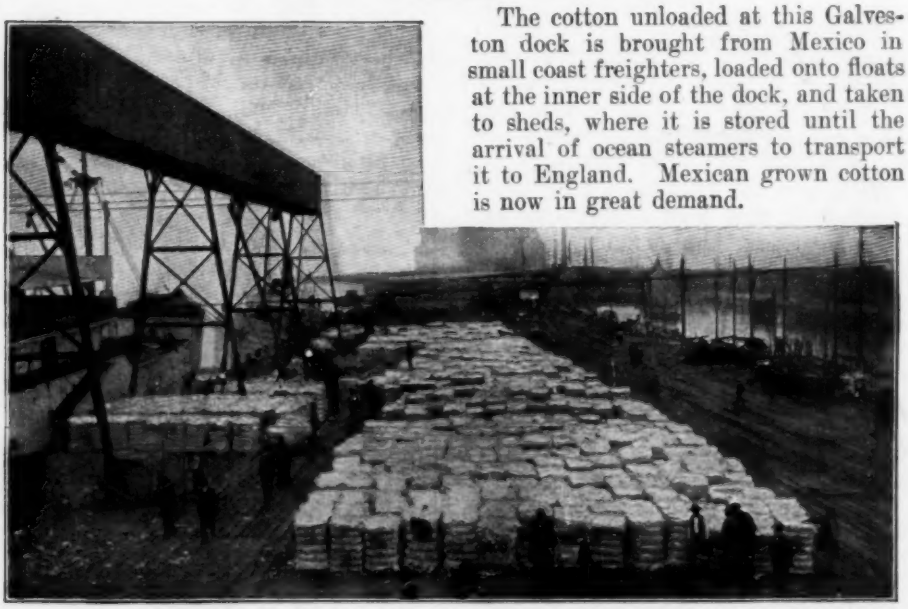
SINKING FLOORS TO PROTECT THEATER AUDIENCES FROM FIRE

A prominent German constructing engineer has devised a novel and somewhat remarkable scheme of fire protection for theaters, which he proposes to demonstrate this summer by the building of a theater and then its destruction by fire to prove the complete availability of the system.

In case of a fire an electric button is pressed and the whole parquet floor is automatically sunk a distance of 7 ft. Asbestos flooring then shoots out from different parts of the theater, making a fireproof covering over the heads of the people as they make their way to the streets through numerous exits. At the same time the audience in other parts of the house is protected by steel curtains which drop in front of the boxes and balconies.

A SOUTHERN COTTON DOCK

The cotton unloaded at this Galveston dock is brought from Mexico in small coast freighters, loaded onto floats at the inner side of the dock, and taken to sheds, where it is stored until the arrival of ocean steamers to transport it to England. Mexican grown cotton is now in great demand.

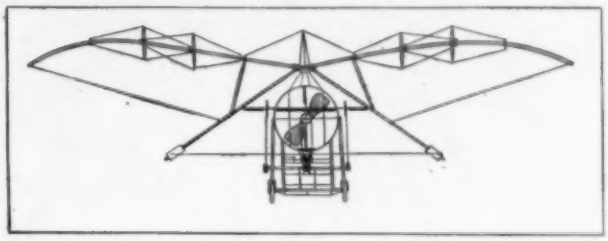


One of the Great Cotton Docks—Vessels Loading for Euro

ALUMINUM HEAVIER-THAN-AIR FLYING-MACHINE

Mammoth Mechanical Flyer Is Balanced Like a Bird

Dr. A. R. Silverston, a Milwaukee inventor, backed as a partner by Woods Plankington, one of Wisconsin's younger millionaires, has completed a heavier-than-air flying machine, which, in addition to the aluminum construction, has two distinct features, both of which are worthy of serious consideration. The first, and probably most important, is the method by which the inventor expects to automatically maintain the equilibrium of his machine, so that the center of gravity will always coincide with the center of air pressure. The second is the method of propulsion and maintenance in the air.



The main portion of the machine consists of a cylindrical body 8 ft. 3 in. in diameter, by 24 ft. long, mounted and supported 6½ ft. over the body of the car, which is 16 ft. long and 9 ft. wide. This cylinder is constructed entirely of 30-gauge aluminum sheeting and to prevent these thin sheets from collapsing, trusses are run across 12 in. apart. Over 22,000 rivets were used in its construction. Inside the cylinder or drum is an 8-ft. cast aluminum propeller, which is held in place by light steel and aluminum tubing. The propeller has two blades and is driven by a sprocket chain from the 40-hp. engine located in the car.

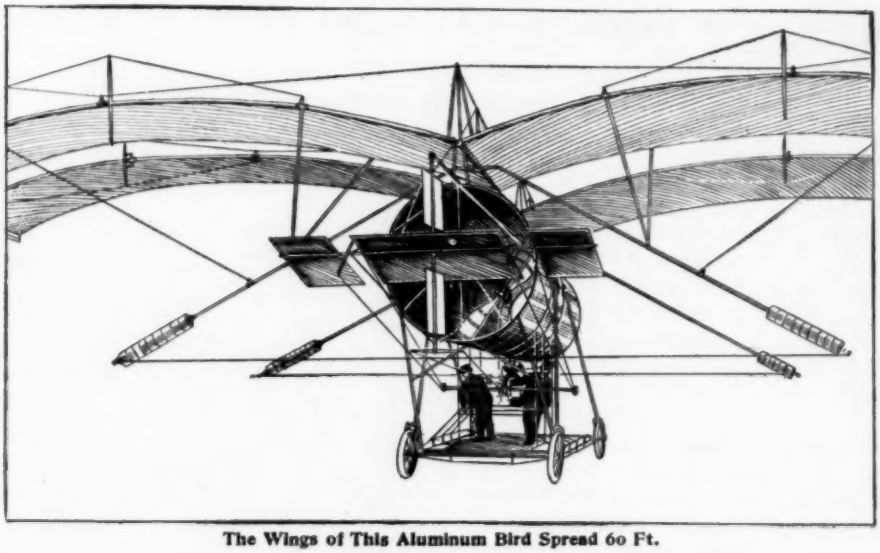
Above the cylinder or drum, are two sets of carrying planes or gliders, one set adjusted across the top of the cylinder at the front, and the second across the top of the cylinder at the rear, a space of 12 ft. intervening.

The two sets of wings or gliders are independent each of the other, but the wings of each set have only a see-saw motion—that is when one wing goes up its mate goes down correspondingly.

Each pair of wings has a total spread of 60 ft. from tip to tip, and are 6 ft. wide. From these two great pivotal planes, covered with oiled Japanese silk, the cylinder and car hang like a pendulum from a clock.

The theory is a simple one. Revolving the propeller at a sufficient speed a partial vacuum is created and consequently the machine is drawn forward. The planes are not necessary to keep the machine sailing through the air. Their mission is to maintain an absolutely automatic equilibrium, holding the cylinder and car vertically in suspension, no matter from what direction the wind.

As shown in the illustrations, two balance rods connect with the shaft of each pair of planes and straddle the cylinder. At the ends of these rods are weights, sufficiently heavy to swing the planes back to a horizontal position when the pressure of the wind is withdrawn. Piano wires fastened to the framework of the planes connect them with the ends of the balance rods, which are themselves connected by two piano wires run between the cylinder and car. Flying south, for instance, with the wind blowing from the west, the wings execute a movement like a bird gliding through the air, but the car and cylinder hang straight down. Under this condition, the wings of the two planes on the right side swing up from their horizontal position, and at



The Wings of This Aluminum Bird Spread 60 Ft.

the same time the wings on the left side swing just as far downward. The supposition is that before the planes could swing far enough around for the balance rods to strike against the cylinder, thus throwing the machine off balance, the left wings would also catch the wind, and meeting with this resistance, aided by the weights on the right-hand balance rods, continue to maintain the equilibrium.

The greatest problem was to make the pivotal planes so as to obtain the required angles and distances thereon, and still keep the original spread of 60 ft., monoplane system.

The steering apparatus is fastened to the forward opening of the cylinder, and consists of a lifting or horizontal rudder, which has an area of 48 sq. ft., and a vertical rudder having an area of 16 sq. ft. Both are operated by steering wheels from the car.

Dr. Silverston believes that the machine has the full power of a strong and perfect gyroscope. The pivotal planes have a surface of 750 sq. ft., with an additional plane area on the cylinder, including the horizontal rudder, of 650 sq. ft.

Although built almost entirely of steel and aluminum the entire machine weighs only 1,400 lb. Nearly 900 castings were used in its construction, 250 of which were of different patterns. The big cylinder weighs 198 lb.

Only two tests have been made, both of which were without the planes in position, but from these tests the inventor is confident that the machine is a success and will fly under perfect control at a speed of at least 80 miles an hour. With the propeller running at 300 revolutions a minute it was necessary for six men to strain at the machine to keep it from forging ahead and rising in the air. At this speed of the propeller a current of approximately 320,000 cu. ft. of air a minute was drawn through the cylinder.

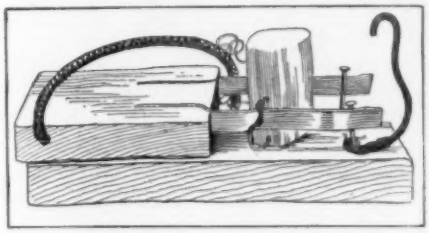
According to Dr. Silverston the experiment demonstrated clearly the complete efficiency of the propeller to lift and move the machine with ease at 300 revolutions a minute, and that it can utilize 90 per cent of the horsepower developed. Without taking momentum into consideration a speed of 37½ miles an hour was figured out in the tests, with the propeller making only the 300 revolutions above mentioned, and only 8 hp. being used. The high efficiency speed of the propeller is mathematically figured out to be 1,680 revolutions a minute; the maximum speed of the en-

gine is 2,000 revolutions. The propeller is geared 3 to 1.

The gasoline is carried in two elongated tanks, holding 14 gal. each, sufficient for three hours' flight. The machine is designed to carry at least 1,000 lb. more than its own weight.

DANGEROUS DOUBLE-POLE SWITCH

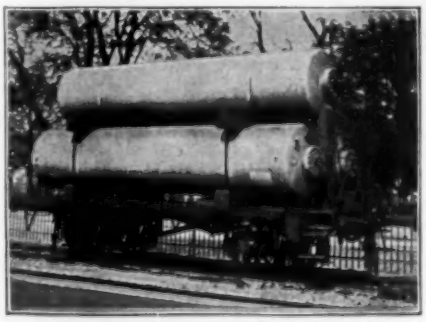
This dangerous but unique double-pole switch was found by the Chicago electrical inspection department. It was



Dangerous Home-Made Switch

doing service in a regular lighting circuit, and although dangerous as a fire hazard, it showed considerable ingenuity on the part of the designer.

Wires were attached as shown in the illustration, and two pieces of spring steel and two nails formed the points of contact. An oblong block of wood mounted on a pivot between the strips of steel served to connect the circuit. To break the circuit it was only necessary to turn the block sufficiently to force the steel strips from the nails.



For Shipping Gas: Germany

TOPPING A CYPRESS TREE

Perilous But Exciting Work in Midair

A Thrilling Moment

The work of topping a cypress tree looks dangerous as shown in the illustration, but in reality is quite simple, if the chopper knows his business. Properly belted and spurred, he climbs to the top of the long bare trunk and

makes himself fast with straps and steel snaps. He digs the spurs of his climbers into the trunk, swings himself outward, and begins to chop. When the trunk is almost severed he leans far out on the opposite side from which the top is to fall and with a well-directed blow sends it crashing to the ground.

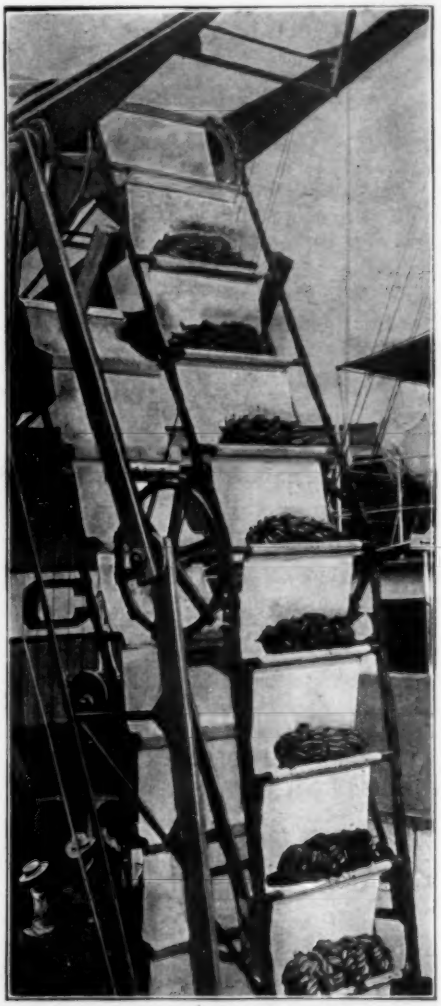
A steam logging skidder was to be placed under this tree and it was topped so that falling limbs could not endanger the lives of the workmen under it. Its height was 150 ft.—Contributed by Chas. Martin, Harmony, La.

ELECTRICAL BANANA UNLOADER FOR SHIPS

At least two-thirds of the ordinary waste accompanying the shipment of bananas by water is prevented by this electric unloading apparatus. At New Orleans, where the machine is in use, over 7,000,000 bunches of bananas are annually unloaded. Formerly this work was all done by negroes who were stationed in the hold at one hatch at a time. They passed the fruit from deck to deck, and then to the shore, as a bucket brigade passes water from hand to hand.

With the machine, only a few negroes are needed, the fruit is not bruised, and 2,500 bunches per hour can be unloaded. The apparatus is built upon a platform upheld by 10 trucks. From the platform booms rise in the shape of a hinge which opens and shuts. When ready to commence operations, the hinge is opened and the lower joint dropped into the hold. The canvas carrier, which revolves around pivots placed at each end of the steel boom, is divided by bars of wood into pockets 30 in. in length and 48 in. wide. The fruit is loaded into the pockets at each deck by negroes and is swiftly carried up the perpendicular boom and across to the wharf.

A lookout tower is stationed on top of the machine, from which one operator controls the entire mechanism. The trucks on which the platform is built rest on a track which runs the entire length of the wharf, making it possible to move the apparatus from place to place. This is accomplished under its own power.



Mammoth Unloader

The Nantucket Central railroad has adopted motor cars in place of the steam locomotives hitherto in use. The motor cars will run on the same tracks under their own power. The road is 8 miles long.

Coal briquettes proved unsatisfactory on the flagship "Connecticut."

COOKING SCHOOL IN THE NAVY

Methods Used for Obtaining Good Cooks on Our War Vessels

Naval officials believe that the best way to make a man efficient and keep him contented is to feed him well. Sometimes there are complaints of the food in the navy, but in most instances the complaint is unfounded; and in the few cases where there is cause for grumbling it is either due to conditions which make it impracticable to supply fresh provisions, or to an incompetent or unreliable steward or cook.

In order to prevent good food being spoiled by poor cooks, the department has recently established a school at Newport, R. I., for ships' cooks and bakers. It is the purpose to send to this school all men recruited as cooks or bakers. In addition, men already in the service, who want to become cooks, and can show some fitness, will be sent to the school in limited numbers.

The school will be equipped with electrically driven meat choppers, large bake ovens, coffee urns holding 50 gal., mechanical dishwashers, cold storage, dough-mixing machines, and several ranges, sufficient to prepare a meal for three or four hundred men. It will be on the same plan as the galley on board a battleship.

The instruction will last for four or five months, and will be under the supervision of a chef, while a first-class ship's cook will be in charge of each galley.

The recruits will first be put to work tending fires, cleaning up, and helping prepare the food. They will be given certain dishes to prepare, and finally will be placed in charge of the galley, superintending the cooking of an entire meal.

The students will also be required to take part in military drills, and while at the station will swing in a hammock, so that when they complete their instruction and are sent to a man-o'-war they will be familiar with the mode of living.

Ships' cooks are paid from $25 to $55 a month, and as they have no living expenses, their pay is nearly all clear money. Every recruit is supplied with an outfit of uniform which usually lasts a year. The pay is materially increased with each re-enlistment.

Ships' bakers get $35 and $45, while a chief commissary steward is paid $70 a month, with allowances.

With the inducements of good pay and the thorough instruction received at the school, the navy is enabled to furnish the fleet with first-class cooks, bakers and stewards.

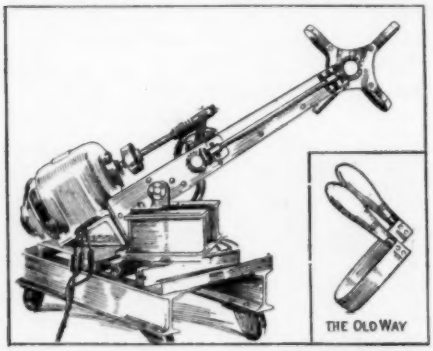
SHAMMING THE LOSS OF AN ARM

The genuine cripples of Paris have organized a club for the purpose of protecting themselves by exposing sham cripples. All the members of the club are delegated to keep a close watch for mendicants who live by feigning the loss of limbs, and reporting every instance they find to the authorities.

These illustrations show one of the simplest tricks by which sham cripples awaken the pity of the passer-by. A false stump is attached to the shoulder, and the arm at that side is tied to the body. The full blouse does the rest. The man who posed for these photographs had in reality only one leg.

EXCAVATION MACHINE FOR TUNNELING THROUGH CLAY

This electric excavation machine, for use in tunneling through clay formations, is so simple that a day laborer can use it without fear of seriously damaging it through his ignorance of mechanical tools. Invented by one of the best known construction engineers in the country, it is designed to take the



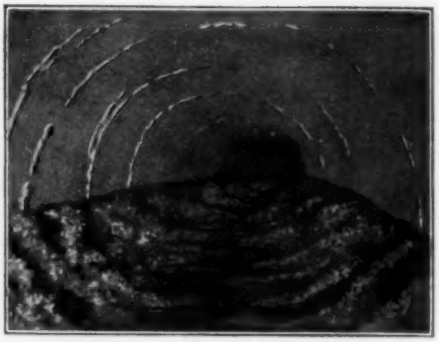
Courtesy Geo. W. Jackson

place of the gangs of 6 or 8 men who still cut into the formation at the head of a bore with the crude excavation knives used years ago.

One man operates the machine, standing back of the carriage. As the four hoop-shaped knives whirl into the clay the operator moves the long arm up or down and to either side, pushing the car further along as it cuts. A conveyer attachment catches the clay as it drops from the knives and carries it back to the dump carts.

CEMENT WATER PIPE AFTER 18 YEARS' SERVICE

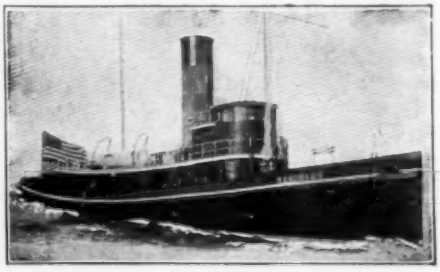
The clogged condition of a 30-in. cement water pipe after 18 years' service in southern California is shown in this illustration. The foul condition on the sides and bottom is a hard deposit of lime, common in the arid regions. The primary cause of the fouling was the failure of the workmen to remove the mortar squeeze at the joints and the gravel dropped during construction. These formed obstruction and the lime, which is hard and



cement-like, lodged against them and clung, greatly reducing the capacity of the conduit.

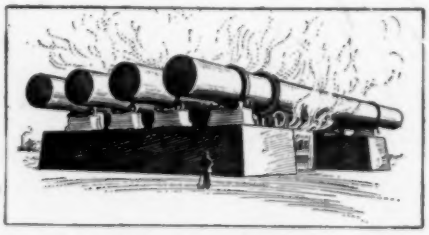
TUGS TO STEAM 14,000 MILES WITHOUT STOP FOR FUEL

The problem of providing oil for the two oil-burning tugs, "Hercules" and "Goliah," on their 14,000-mile trip to the Pacific coast was solved by fitting out one of the tugs as a tank boat, and having it towed by the other. In this



U. S. Tug "Hercules"

way the two tugs are making their way around the continent without having to stop for fuel. Oil, unlike coal, cannot always be procured at call in every port.



Rotary Cement Kilns

MAKING TEST BORINGS WITHOUT WATER

In drilling test holes in earth most boring machines use water to wash up the material or to make the drilling easier, a method somewhat unsatisfactory because the action of water changes some earths materially by softening and washing away fine sands. This inexpensive, portable machine does the work without water, and at the same time takes a core.

The drilling is done with one of the several tools attached to the drilling rod most adapted for the particular kind of ground being drilled. The tool and rod are operated inside the casing by the men on the platform, who raise and drop them like a churn drill. The men on the ground rotate the casing, which has a sharp cutting shoe on the lower end. The casing, with its burden of platform and men, keeps cutting and sinking into the ground several inches ahead of the tool. The material which enters the casing is drilled and forced into a sand pump at the same time. An accurate core is thus obtained, and the exact nature of the ground shown. The casing is generally of 4-in. pipe.

FIRELESS STEAM ENGINES

A railway locomotive running along under a full head of steam, but with no fire box and no fire, is the latest

Makes No Smoke

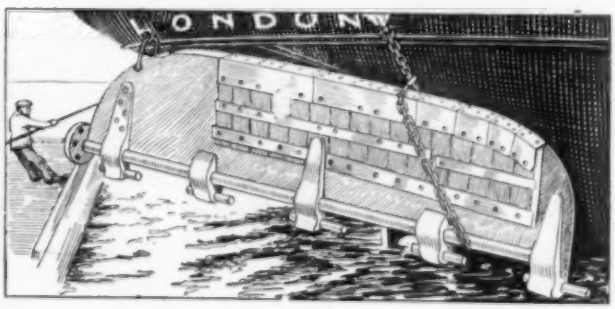
German type of engine for use in shops and yards where the presence of fire and sparks would be dangerous.

The engine is run by superheated steam under high pressure. This is condensed in a chamber, one-fourth of which is filled with cold water, surrounded by an insulating air mantle. Several iron jackets and a felt layer cover the condenser. The condensing continues until the temperature and the pressure equals that in the feed boiler.

Glass telephone poles, reinforced by wire, are being used in some parts of Germany.

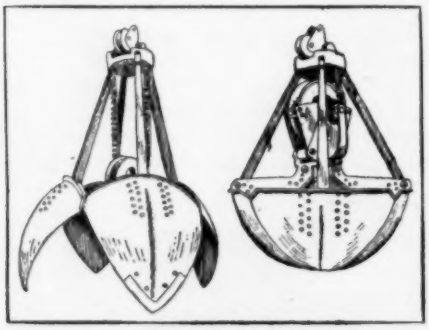
REPAIRING A SHIP'S RUDDER

This rudder was damaged by a storm at sea and the vessel put into the nearest port to have it repaired. In the illustration it is being placed in position again, somewhat patched but still capable of steering the great hulk which would be so helpless without its services.



ORANGE-PEEL BUCKET FOR DREDGING

This extra heavy standard orange-peel bucket is built in sizes of from 1



Lifts 7-Ton Rocks

to 10 cu. yd. capacity and 5 to 12 ft. diameter when closed. At New Brunswick, N. J., rocks weighing six and seven tons were handled by a 1½-cu. yd. bucket, the capacity varying from 300 to 500 cu. yd. per day.

ELECTRIC RAIL BOND WELDER

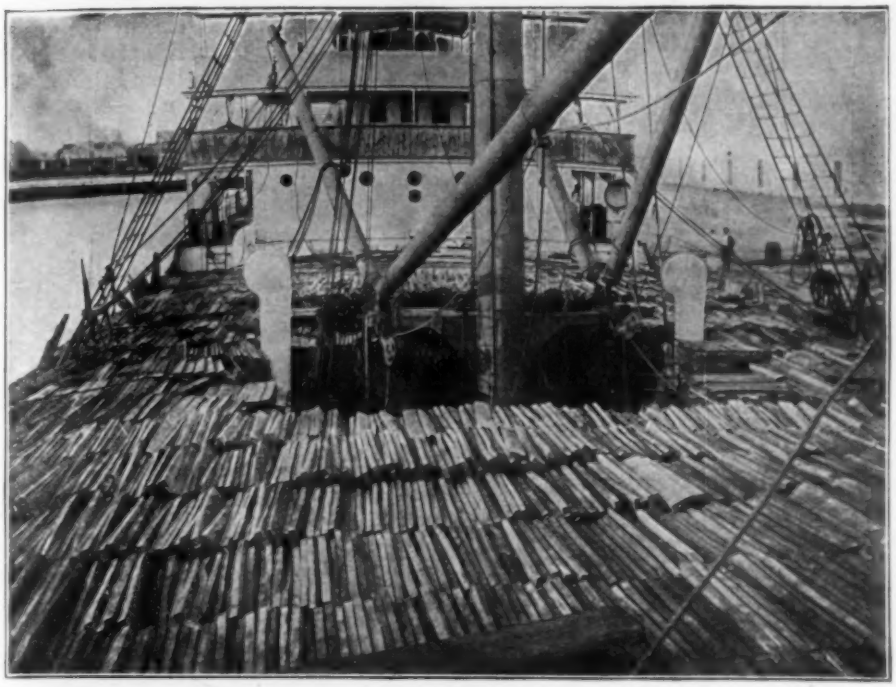
This machine is in use by the Toronto Railway Company for joining the ends of their rails with copper strips so as to make perfect electrical connection between them, and thus overcome the troubles of faulty contact at the fishplates. Each rail is joined to its neighbor by a copper band electrically welded to them by this machine. The machine takes its power from the overhead wire by the trolley pole, which is just cut out of the picture. All the appliances necessary are mounted on the truck, which has a traction device by which it can be driven from one rail joint to the next. The work is done by the two carbon-faced jaws shown in the picture above each rail. The amount of heat required is controlled by the rheostat, shown also. The work is done much more easily, quickly and better than by the old method, and without much delay to traffic over the lines, as might be expected. This is overcome by employing a pivoted jack in the center of the truck, which lifts it from the track and allows it to be turned and pushed off to the side of the road to allow cars to pass. It usually takes about 5 minutes to finish one rail-joint, a man working at each rail at the same time. —Contributed by A. M. McPherson, Toronto, Can.

Portable Electric Welder

MACHINE TO REVEAL HUMAN EMOTIONS

Wonders, or supposed wonders, never cease. The latest is a machine called the "Phlethysmograth," and tells whether or not you are worried, frightened, angry, or happy, by recording the varying effects of thoughts and emotions upon the circulation of the blood. It consists of a sort of sleeve into which the arm is inserted. Any shrinkage or dilation of the blood vessels is shown by the rising or falling of a column of water in a glass tube connected to the sleeve. The supposition is that not only the pulse beat but the fullness of the blood vessels vary with the different emotional states, and that this machine tells just which emotion is uppermost, no matter how successfully the patient hides his or her thoughts.

The Pennsylvania railway will soon be running trains composed entirely of steel cars between Chicago and New York.



After Filling the Hold the Staves Are Piled 10 Ft. High on Deck

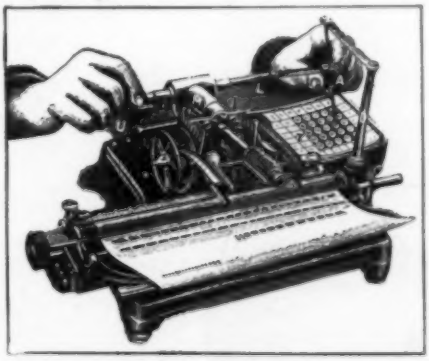
SHIPLOAD OF STAVES

This ship, en route from Galveston to Antwerp, is heavily loaded with staves, a somewhat unusual cargo to start from that southern city. The value of the full cargo is $50,000. The cargo is more bulky than heavy, and after the hold was filled the staves were piled 10 ft. high on the deck.

TYPEWRITER WITHOUT KEYBOARD

This French typewriter is built on the idea that speed means complicated and exceptionally accurate mechanism, and that such mechanism means a price that is prohibitive to a large number of people. Speed was therefore sacrificed and the machine was built with as few parts as possible.

It carries no keyboard and the designation of characters to be used is made by a stylet or needle which is moved by the left hand of the operator until its point is over the desired letter, figure or sign enameled on the plate. The characters are arranged line by line on a cylinder, and as the stylet is moved over the plate this cylinder revolves and advances or recedes until the desired



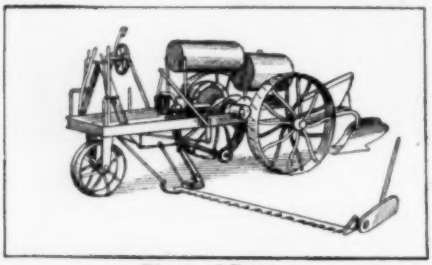
Not Built for Speed

character is in the proper position to make the impression on the paper. A key is then struck by the right hand and the impression made. Another key makes the spaces between words.

GAS POWER DIRECTLY APPLIED TO FARM IMPLEMENTS

The gas traction engine, which is so widely used on the larger farms of the country, now has an auxiliary in the self-contained principle of applying gas power to the implements themselves. By this principle the power will be part of the machine it is driving, not connected to it in the form of a tractor which pulls it or drives it by belts.

One illustration shows a mowing machine which can be changed into a plow. The other is a conception of a

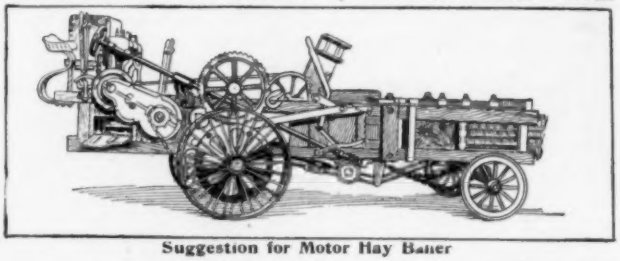


Plow and Reaper

hay bailer thus equipped, and is the idea of Gas Power. No one has as yet made such a machine, but its advantages would be great.

GERMANY TO FORTIFY HELIGOLAND ISLAND

A deep impression has been produced in European naval circles by the decision of Germany to fortify the island of Heligoland, which is about 14 miles off the mouth of the Elbe in the North sea, and turn it into a naval base. With



Suggestion for Motor Hay Baler

this island and the shore fortified with the type of guns carried by the "Dreadnaught" it would be almost impossible for the ships of an enemy to pass the mouth of the Elbe. Heligoland became a great strategic base when the Kaiser Wilhelm canal, connecting Kiel with the mouth of the Elbe, was completed a few years ago.

LOCOMOTIVE WARMS DEPOT

A fire recently consumed the plant which furnished heat to the Union depot at Kansas City and power to operate the interlocking switches and signals in the yards. To meet the sudden emergency a Chicago & Alton mammoth engine was coupled to a coal car and headed in close to the depot, where it furnished sufficient steam heat to keep the building at an even temperature of 70 deg., and also supplied the power to operate the interlocking switches.

"The Only Way" to Heat the Kansas City Depot

THE GHASTLY END OF OLD HORSES

"Tied in Roughly Constructed Stalls Between Decks"

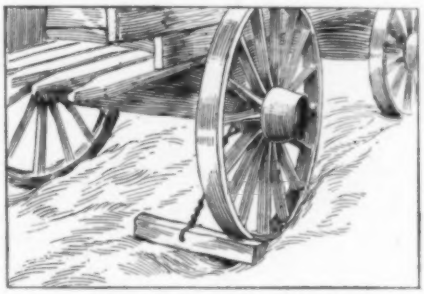
Horrible and revolting to the extreme is the traffic in old worn-out horses regularly carried on between England and the Netherlands, ending with the final scene in which the most useful and human of all domestic animals is served up on a platter in the form of so-called Bologna sausage and filet d'anvers.

The sufferings of the horses are the most intense during the passage from England to Rotterdam on shipboard. Tied up in roughly constructed stalls between decks, they are at the mercy of the storms, and in many instances are thrown into tangled heaps on top of one another. All that survive are dragged from this tangled heap to start the miserable procession through the streets to the abattoir or slaughter house, their most unsightly wounds covered with sacking.

This traffic is sanctioned by the British Board of Agriculture, and the society for the prevention of cruelty to animals found in a recent investigation that no avoidable cruelty was suffered, although many cases were noted of horses in agony from disease and horrible wounds.

SIMPLE AUTOMATIC WAGON BRAKE

In drawing heavy wagon trains up hilly or mountainous roads the rear wagon is often provided with the automatic brake shown in this illustration. It is simply a block of wood, about 2 ft.



Fence Wire; Block of Wood

long and 4 in. square, fastened by a wire to the rear axle. The block drags along the ground behind the wheel and works automatically the moment the horses slack up.

SIMPLE PROCESS OF MAKING CHARCOAL

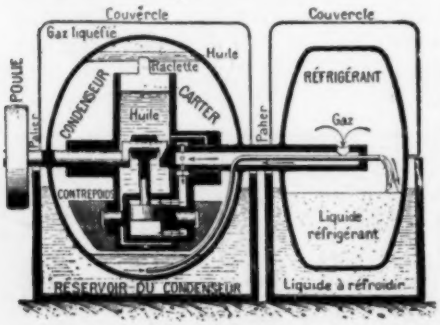
At some of the sawmills along the California coast, numbers of negroes can be seen busily at work converting the accumulation of slabs into charcoal. The slabs are placed in piles, carefully covered with seaweed and earth, and then fired. The bags contain charcoal ready to be hauled away.

Working Up Mill Waste into Valuable Product

ROTARY ICE MACHINE

This motor-driven rotary ice machine, invented by a Frenchman, makes small pieces of ice in from 3 to 10 minutes, and can cool from ½ to 12 qt. of water per minute, according to the size of the machine. The advantages claimed for it are its extreme simplicity, small power required, small quantity of condenser water necessary, and safety in operation.

The refrigerant used is sulphurous acid. The compression system is employed, but without the use of suction or discharge valves, stuffing boxes, gauges and cocks. The machine is composed of two spherical bodies attached to a single shaft rotated by a pulley. The power required for ice-making is ¼ hp. for the 4-lb. per hour machine, and 2 hp. for the 100-lb. per hour machine.

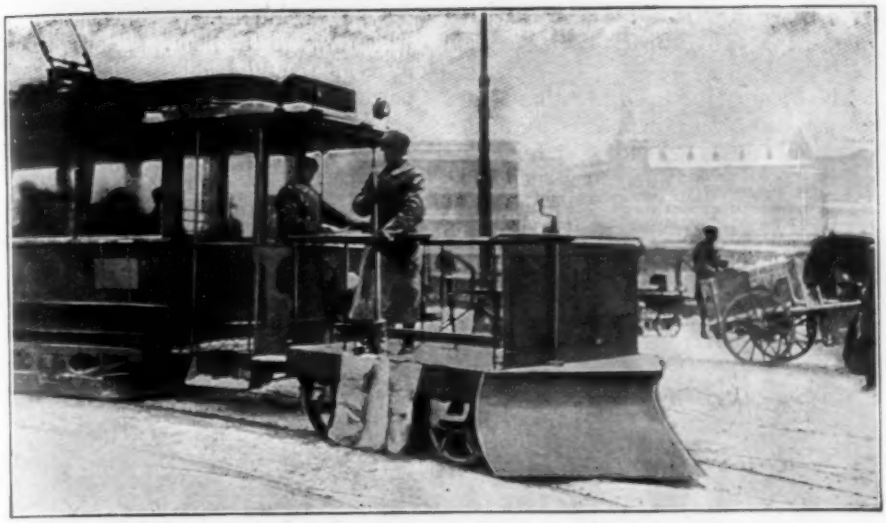


Courtesy Ice and Refrigeration
French Ice Churn

SHORT LIFE OF MODERN SHIPS

Not more than 20 years ago the first express steamship was introduced to the world by one of the big trans-Atlantic companies. She was considered a marvel of perfection in every detail, but a couple of months ago was sold as scrap iron. A great warship built at about the same time was recently destroyed as a target for the guns of newer ships. The life of a ship is short but full. A great navy can become obsolete or practically so in 10 years. Many of the old-time wooden frigates lived four times as long as modern steel battleships.

Chicago packers are selling gallstones to the Japanese at $14.94 a pound. What the Japs do with their queer purchase is a mystery.



Not an Observation Car—Just a Snow Plow

SNOW PLOW ATTACHED TO STREET CAR

On the street railways in Stockholm, Sweden, snow plows are attached to the front of ordinary passenger cars. One man to control the plow and brooms is all the added crew necessary.

CALL BELL ON HITCHING POST

A western druggist, with an eye for business, extended his hitching post a couple of feet and placed an electric call bell at the top of it. Prospective customers, arriving in carriage or automobile, press the button without leaving their seats, and the drug clerk immediately attends to their wants. The same bell is used for night calls. A ½-in. gas pipe extends from the top of the post to the second floor, carrying the wire to the druggist's living quarters. The extension from the top of the post to the bell is of 1-in. gas pipe.

ENGLISH BOILERS FOR AMERICA

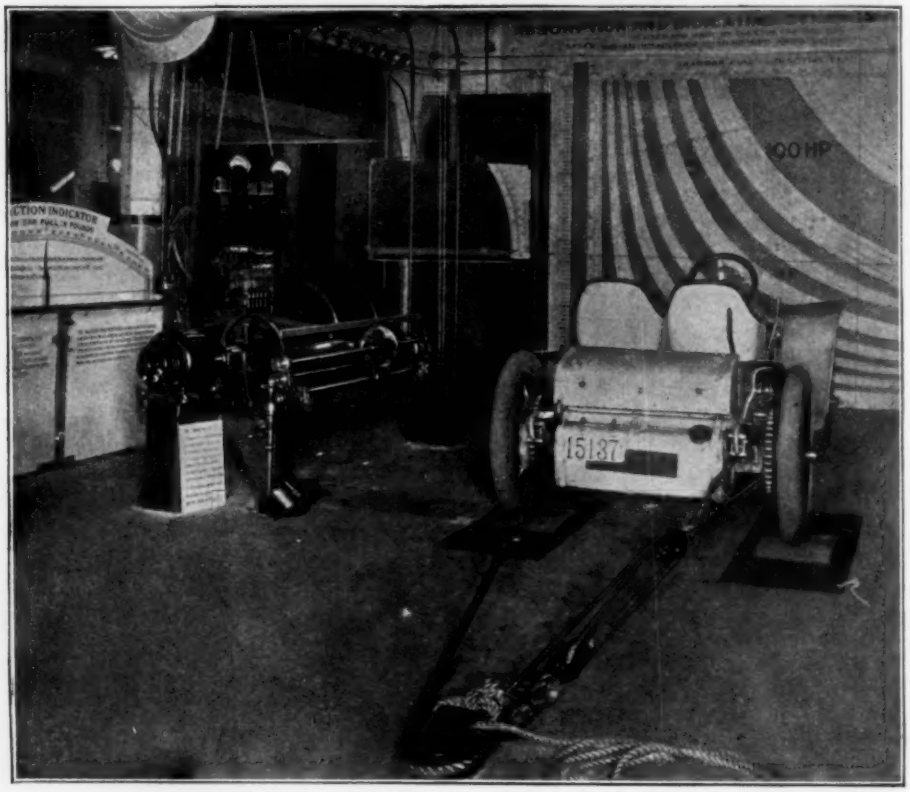
With the high tariff wall to guard the United States from industrial invasion it would seem impossible for foreign manufacturing concerns to compete with manufacturers of the same kind of product in this country. This boiler is being landed at an American port after a stormy passage across the Atlantic ocean from England.

Made in England

UNIQUE AMERICAN AUTOMOBILE DYNAMOMETER

The accompanying illustration shows the equipment of the new Absorption and Indicating Dynamometer for automobiles as devised and constructed by the Automobile Club of America, for the use of its members. This novel machine determines instantly the speed from 1 to 75 miles per hour, as well as the speed in feet per second, also the draw-bar-pull or tractive effort from 0 to 1,600 lb. It gives the horsepower from 0 to 85 at 20 miles and 213 hp. as the limit at 50 miles, while it also gives the grade-climbing ability and power of the brakes of any auto car tested by it.

The car is placed in position with its rear wheels in contact with the wheels of the dynamometer, which just projects through the floor. The car is held by a block and tackle while its motive power is placed in operation. The revolving rear wheels of the auto transfer their speed, horsepower and pull to the wheels of the dynamometer, which records the draw-bar-pull and tractive effort by the recording needle on the board to the left in the engraving, at the same time recording the speed and horsepower by the cross-wires on the board in front of the car. This is all operated by the dynamometer shown to the left of the car.



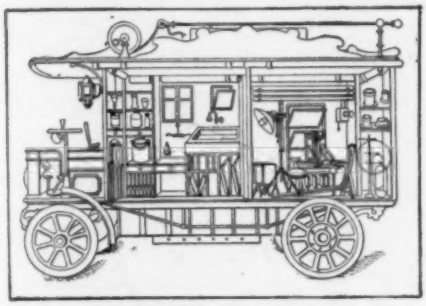
Machine That Determines Power and Speed

The first Perkins medal awarded for achievement in applied chemistry has been presented to J. R. R. Herreshoff, in recognition of the improved methods he has introduced for refining copper.

COMPLETELY EQUIPPED PHOTOGRAPHERS' AUTOMOBILE

This photographers' electric automobile, completely equipped to take, develop and print photographs, has been placed on the road by a German photographer. The storage battery which operates the car supplies light to the studio where cameras, backgrounds, lenses and head-rests are stored. The front compartment carries the developing sink, negative racks, trays and shelves for bottles and chemicals. On the roof is a turntable or stand to be used as a viewing point in photographing street scenes.

The automobile can be propelled by gasoline motor if desired, the motor to make the electric light through a generator when required. A drum is arranged on the roof to hold surplus electric cable, allowing the light to be carried some distance from the car.



Traveling Motor Studio

CHANGE BOOTHS FOR STREET CARS

The greatest drawback to the pay-as-you-enter street cars is the necessity of always having the right change ready when you step onto the platform. Otherwise the service is blocked while the conductor comes to your assistance. Especially is this the case when the passenger has both arms full of bundles.

In Buffalo this problem is being solved by placing change booths in the more congested business districts, where passengers get exact change, which they hand to the conductor as they enter the car.

"Get Change Here"

KEEPING SMALL FRUIT IN COLD STORAGE

Experiments have proved that for freezing small fruits and keeping them in cold storage for several months, the best results can be obtained by use of a closed package, providing it is not so tight as to prevent the escape of gases given off by the fruit after it is packed and before it is frozen.

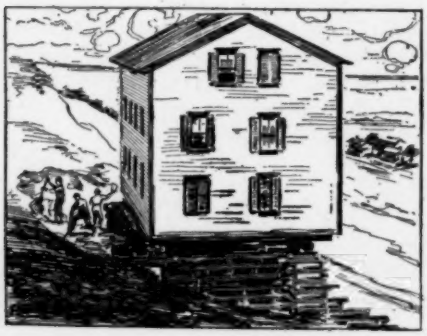
Strawberries and blackberries were frozen for six months in the boxes shown in these illustrations, with varying results. The flavor of the fruit wrapped in the open crates was tainted with the odors from other articles in the storage rooms, and the flavor of the

Strawberries Kept 6 Months

fruit in the triple-wrapped boxes was but little better, having become tainted by the carbon dioxid gas exhaled by the fruit before it became frozen. The flavor of the fruit in the double-wrapped carton, however, was not contaminated and retained much of the flavor of the fresh fruit. The frozen fruit is used in making fresh fruit pies and fruit ices in midwinter.

A HILL-CLIMBING HOUSE

This large four-tenement dwelling house is slowly but surely climbing up, over and beyond the steep side of Fort Hill, in East Providence, R. I. The



House Climbing the Hill

task is considered one of the biggest and highest house-lifting feats ever attempted. The same system of piers, with the usual blocks, wedges, beams, rollers, shoes, capstans, and chains as used in ordinary house-moving are being employed, but the greatest skill and exactness is necessary to keep the whole structure firm and level while progressing up the slope.

One of the principal features of the work is in terracing the hill. Flat squares of dirt are dug out, making a flight of immense steps over which the building makes its laborious ascent to the top. From step to step the structure is raised by screws, and then a wedge-shaped shoe is inserted under the main supporting beams, rollers are placed, and the house dragged onto the terrace. It takes two days to raise the house from one terrace to the next, but only 40 minutes to drag it onto the terrace afterward.

SHIP ELUDES TEN WATERSPOUTS

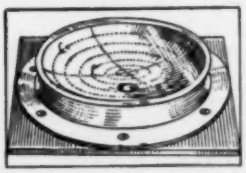
In a recent passage of the Norwegian steamship "Cecilia" from Cartagena, Spain, to Philadelphia, 10 waterspouts were encountered and successfully eluded. In the wake of a hurricane off the Carolinas in which the vessel was buffeted for 12 hours, came the waterspouts. The first was seen on the starboard side, and its large size brought terror to the crew. The captain evaded this spout, only to find the vessel apparently running into the track of another one. From port to starboard the "Cecilia" was steered around 10 spouts over a course extending only 5 miles.

"PAY-AS-YOU-LEAVE" STREET CARS

Following close upon the heels of the "pay-as-you-enter" street cars, comes the "pay-as-you-leave" type of cars, patented by the chief engineer of one of the large rapid transit companies of the East. The great advantage of the latter type over the former is claimed to be in the fact that passengers can much easier get their money ready while riding than with their arms full of bundles on the street.

AN AEROPLANE LEVEL

This device is a level for determining the angle at which an aeroplane is flying. It consists of a concave brass dish in which a drop of mercury naturally centers when equilibrium is secured. The circular lines are set about one-fourth of an inch apart, the first four lines representing an angle of about 2 deg.



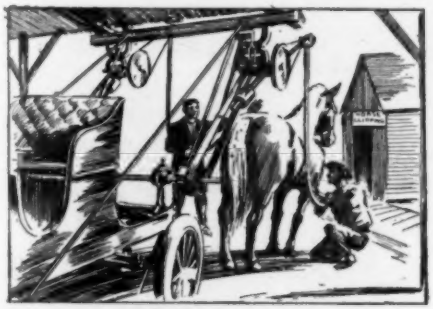
The Level

THEATERS ON TRAINS

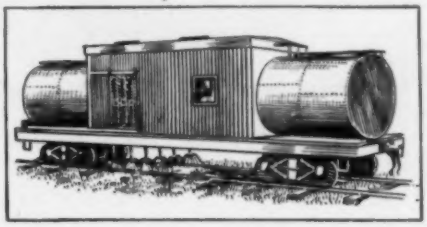
A company is being formed in Paris for the purpose of providing theater cars for all the important express trains on the continental lines. These railroad theaters are to have 60 seats, a little stage, and an orchestra consisting of a piano, a flute and a cornet. Passengers will book seats as they now engage tables in a dining-car.

HORSE-CLIPPING MACHINE ATTACHED TO AUTOMOBILE

With this handy and practical horse-clipping outfit two men can travel through the rural districts plying their trade with satisfying returns and enjoy the pleasures of an automobile trip as they do it. The transformation from pleasure to work is simple. The tonneau is removed and a double horse-clipping machine is connected to the engine shaft by belt and pulley. Half an hour after completing the task the clipping machine is dismounted, packed away and the automobile speeding on to the next job.



Auto Horse Clipper



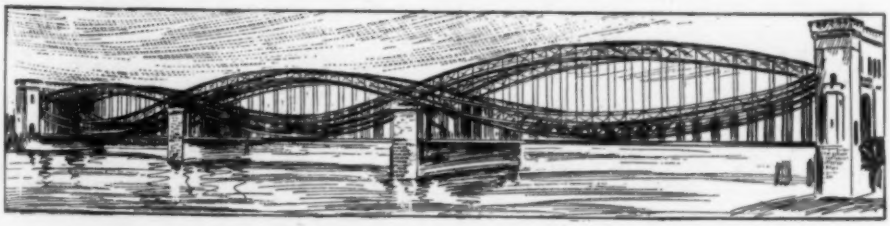
KILLING WEEDS WITH CHEMICAL SOLUTION

Another recent invention for the destruction of weeds along railway tracks is the chemical sprayer shown in this illustration. The outfit consists of a 40-ft. flat car, carrying two tanks of 4,000-gal. capacity. Between the tanks is a cab for the storage of the necessary chemicals and steam-heating apparatus. The spraying apparatus consists of six nozzles arranged in a line across one end of the car. The solution used is a secret, but tests of its efficiency are satisfactory. Only one application is necessary to kill vegetation root and branch. Each mile of track takes 500 gal. of the solution.

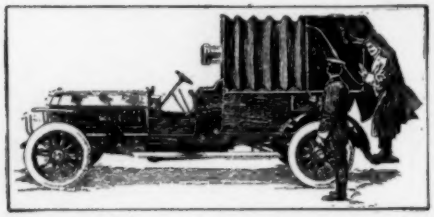
THE NORTH ELBE RAILWAY BRIDGE

Crossing the North Elbe near Hamburg, Germany, there is a most interesting and novel bridge of the type seen in the accompanying view, with three spans, massive masonry archways or towers being constructed at the entrances; short arched steel spans being employed for the approaches.

Each of the three spans measures 325 ft. in length, and it is estimated that the entire weight of the steel work of the bridge is about 4,500,000 lb.



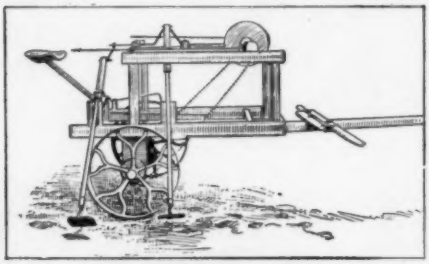
Elbe Bridge Near Hamburg—Each Span 325 Ft. Long



The subject of this illustration is simply the dream of an enthusiastic motoring photographer in Motor, London; but every great or small invention was at one time the same kind of a dream. Today is a period of big things and photography has its place in the race. One enthusiast is preparing to take life photographs for $1,000 each. It is not unlikely that if some enterprising photographer started out with a giant camera mounted on an automobile he would find people desirous and able to pay for extra large landscape photographs.

HOEING MACHINE FOR COTTON FIELDS

The interesting device here shown is a hoeing machine used on one of the cotton plantations of Tennessee. By the use of levers and a small friction disc in contact with a larger disc, the operator can regulate the speed and stroke of the hoes so that the cotton



The Hoeing Machine

plants can be cut as desired. The machine receives motive power from a belt and pulley attached to the axle of the machine truck. One machine, operator and team can do the work of from 8 to 15 hand-laborers.

OCEAN RACE TO BERMUDA

An interesting ocean race for sailing craft will start from Marblehead on June 3 and finish off St. David's Head, Bermuda, in as short a time as a spanking breeze and expert skippers can hurry the graceful, white-winged craft over the 675-mile course. The race will be in charge of the Corinthian Yacht Club and is expected to be the leading yacht race of the coming season in American waters.

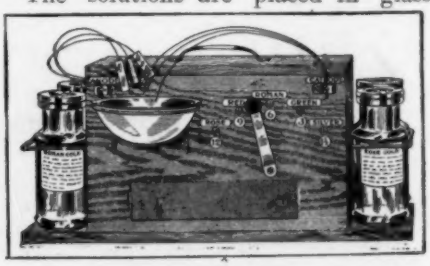
SLEEVES FOR CARRYING SMALL DOGS

Dressmakers in London, England, are now making women's sleeves in which the small pet dogs of society — too delicate to face the cold of winter and too precious to be left at home when their mistresses go out —can be carried in comfort; at least to the dogs. The new sleeves have cuts wide enough for the "canine pets" to "snuggle" into, and yet are not so wide that they can fall out of them.

AUTOMATIC PLATING MACHINE

This automatic plating apparatus is intended for small jewelers who do a limited amount of plating. It consists of a box containing six batteries and a rheostat. By placing the lever of the rheostat at the stops indicated by the lettering, and at the same time using the right solution, the desired shade of gold may be obtained. Silver is plated with 1½ volts, green-gold with 3 volts, roman-gold with 6 volts, red-gold with 9 volts, and rose-gold with 12 volts.

The solutions are placed in glass



Portable Electric Plater

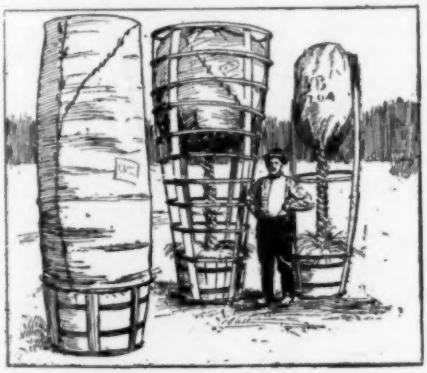
jars at the side of the box, the proper solution being poured in the bowl, where the article to be plated is connected by means of spring clips with anode and cathode wires. The weight of the apparatus is 30 lb.

"MODEL" CEMENT HOUSES FOR GERMANY

Because the Kaiser expressed his enthusiasm over the workingmen's cottages he saw in England, and his opposition to housing workingmen's families in large tenements, a company of German millionaires is being organized to build cottages by the thousands near all German industrial centers. If Edison's model cottages prove as cheap and as practical as he claims, a great number of them may be built in the suburbs of Berlin.

SHIPPING TREES FROM BELGIUM

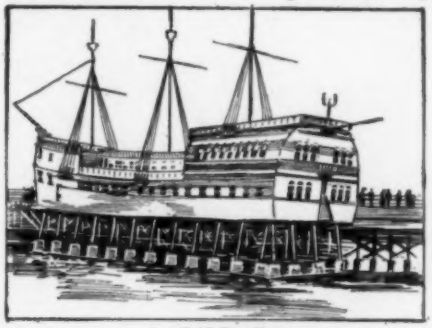
The method of packing the Belgium "Bay" tree for shipment to this country is considered almost perfect. Of a recent shipment of 500 trees across the Atlantic ocean and the American continent to California, not a tree was injured. It requires 4 men to carry one of the tubs, each of which has a pair of heavy ears through which the carrying bars are passed. The largest trees are over 50 years old.



Crating the Trees

SHIP-SHAPE CASINO

This peculiar looking structure is a sea-shore casino and restaurant on the California coast. Wishing something unique to catch the eye of pleasure seekers, the proprietors had it built in imitation of an old Spanish ship. It is 200 ft. long and three stories high.

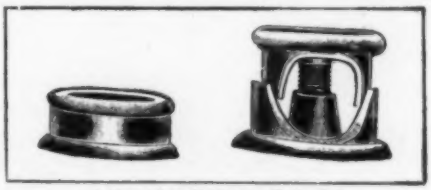


An Odd Pavilion

AN ADJUSTABLE RADIATOR PEDESTAL

Owing to floors of buildings not being level and the settling of new buildings, radiators are often thrown out of level and a strain is put on the piping as well as on the eye of the owner who wants things to look right. To overcome this annoyance an adjustable pedestal has been brought out to take up any unevenness. The sketch shows the pedestal, which consists of two little iron blocks that extend or open from 1 in. to 3 in. by simply turning the top piece, which is so cast that any radiator foot will fit it. A substantial screw holds the two pieces together and allows the proper adjustment.

There is the advantage of allowing carpets or other coverings to be easily put down or taken up without the ne-

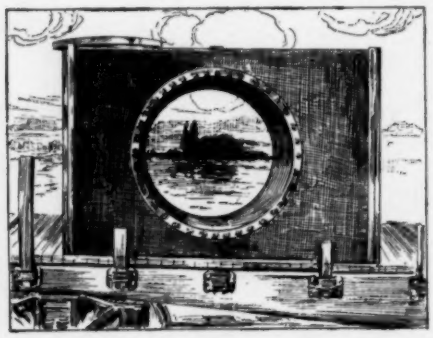


Adjustable Radiator Pedestal

cessity of cutting to accommodate the radiator legs, and should a radiator lose its alignment, on account of the floors settling, the loss can be instantly adjusted and remedied at absolutely no cost. This device can be used advantageously for bathtub adjustments and for adjusting sinks and other fixtures that must stand level on the floor.

MASSIVE STEEL CYLINDER

This is a low-pressure cylinder of a 7,000-hp. engine for generating electric-



Immense Engine Cylinder

ity. Its massive bulk was shipped across the continent from the eastern states to California.

MAP OF FRANCE MADE OF PRECIOUS STONES

One of the most unique gifts on record between two countries is a map of France in precious stones, recently presented to the French government by Russia. It is 40 in. square composed entirely of gold and precious stones. The sea is represented by a pale, rich marble, and the portions of foreign countries necessarily included are in dark gray onyx. France is shown in polished jasper, each department cut from stone of a different color. Some 106 of the most important towns are designated, their names written in letters of gold. The towns themselves are represented in jewels, Paris being marked by a large ruby. The rivers are represented by bars of platinum sunk in the jasper.

The idea of the map is said to have originated with the Czar, who took great personal interest in its execution. The cost is estimated at about $500,000.

LIGHTSHIP BLOWN FROM STATION

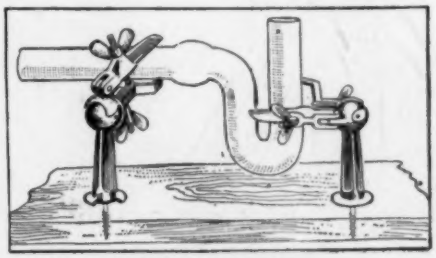
During a recent storm the lightship anchored off the dangerous Nantucket shoals was blown 5 miles from her position, but returned again under her own steam to guard the path of the Atlantic liners. The force of the gale carried the ship along, regardless of the 7,000-lb. sinker, which served as an anchor, and 1,000 ft. of heavy steel chain.

MONEY MADE OF ALUMINUM

For the first time in history, the British royal mint is using aluminum for coinage purposes. In all, 31,872,-132 coins have been struck from this metal, comprising half-cent pieces for use in Uganda and one-tenth of a penny pieces for circulation in the Nigerian protectorates. Both the new coins are perforated in the center to permit the natives to string them as a child strings buttons. Aluminum was used because the immense number and low value of the coins made extremely light metal necessary.

PIPE HOLDING CLAMPS HANDY

A piece of lead or iron pipe can be held in any position desired by the set of clamps shown in this illustration. The holder or clamp consists of a

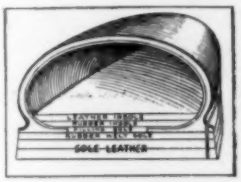


Handy for Plumbers

standard with a wood screw in the bottom for holding it rigidly upright, and a ball or socket joint, with jaws properly shaped to hold a pipe fitting or faucet securely.

COMBINATION RUBBER-LEATHER BOOT

A combination rubber-leather boot is being manufactured which contains a leather inner sole, rubber inner sole, rubber welt sole and a sole-leather outer sole. It is said that this combination will outwear any rubber boot made and prove absolutely watertight.



VOICES IN GERMANY HEARD IN DENMARK

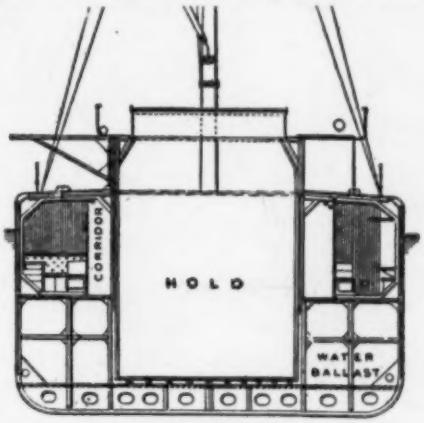
Valdemar Poulson, the Danish inventor whose wireless telephone system is proving so successful, recently carried on a conversation between Wynburg, Denmark, and Weisensee, Germany, a distance of 250 miles, hearing the voices of his assistants clearly as they talked into the transmitter at German station. His latest wireless invention is an ink writing apparatus for wireless telegraph instruments. It writes the messages received automatically, and it is claimed that the record is perfect.

AUTOMOBILE TIRE TRUNK

A tire trunk has been added to the equipment of the up-to-date automobile. It fits inside the spare tire, making a handy receptacle for inner tubes and other small articles which otherwise would take up necessary and available space.

THE HOLD OF A FOREIGN ORE FREIGHTER

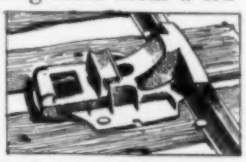
The hold of this Swedish built ore carrier is typical of foreign built vessels of its class. The cargo hold is narrow and high and tends to steady the ship when in a sea. The lower side tanks have the same effect when in ballast. The cabins are arranged along each side of the hold, with a corridor running between. In one section of the hold is a hopper with a capacity of 200 tons of coal.



Cross Section of Hull

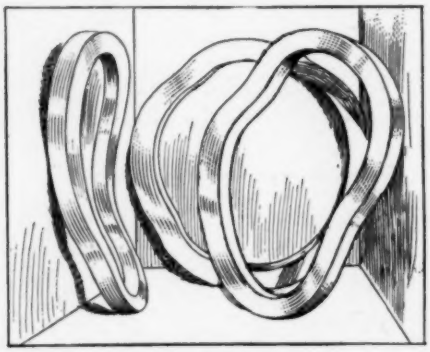
DERAIL PROTECTS MAIN LINES

Every once in awhile a serious railway accident is caused by a string of freight cars breaking loose from a siding and running onto the main lines in front of fast passenger trains. This derailing device is being used to prevent just such accidents. The mechanism is easily seen in the illustration. When cars are left on a siding the lever is pulled and the derailing block slides onto the rail. When an unobstructed track is again desired the block is thrown off in the same manner. The rail is not cut as in most derailing devices.



STEEL RINGS FOR KNEADING CLAY

These misshapen cast-iron rings are used for kneading clay at brick works, and instead of being distorted are perfect in the shape designed for them. The rings are worked round and round in a circular pit, pulled by a team of horses hitched to a long sweep. If the rings were straight the process would be almost useless.



Clay Kneaders

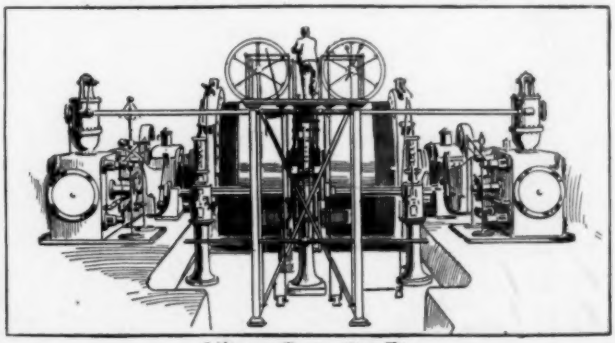
DEEP MINE HOISTING ENGINES

Knowing that the life of every man working in a deep mine is dependent to a great extent upon the reliability of the hoisting engines, every effort is made to get an engine which can be depended upon at all times and under all conditions, adverse or otherwise.

The engine shown in this illustration is designed to operate cages at a depth of 3,500 ft., and is of the first motion type, the steel winding drums being carried by the main engine or crank-shaft. The cylinders are provided with automatic cutoff and governor, and the forward and backward motion is controlled by a steam reversing gear.

With a steam pressure of 140 lb. these engines can lift 17 tons from a depth of 3,500 ft., and will develop 2,500 hp. The weight of the cable alone is 7 tons. The cages are required to make a trip every 12 minutes throughout the 24 hours, which means 120 trips a day.

The operator's platform is plainly seen in the illustration. The operator from his position between the two controlling wheels can handle without help the entire mechanism. All levers are placed close together within easy reach, thus affording absolute control without having to turn from the indicators, which are the operator's only guide to the position of the cages in the shaft.



Lifts 17 Tons 3500 Ft.

CONVERT SHIP INTO FLOATING HOTEL

Plans have been practically completed in England to buy an obsolete ocean liner, take its engines out, remodel the interior, and anchor the vessel in Falmouth Harbor as a first-class floating hotel. Amusements of every kind will be provided for on board ship, and when the guests are disposed to put foot on land, a steam launch will take them to the tennis and cricket grounds and the golf links. The manager of the hotel will be captain of the ship and the hotel staff will be dressed as seamen.

President Roosevelt has approved the recommendation to increase the width of the canal locks from 100 to 110 ft.

THE LAUNCHING OF LAUNCHES

A 16-ft. launch is light and buoyant on the water, but it becomes a dead weight on land and requires several men's strength to haul her on the beach. Boats of larger size increase so rapidly in weight that tackles are found necessary, and boards, rollers, beams, or even regular sliding ways, are required, according to the size of the boat.

One of the handiest contrivances for a skiff is to fasten a sort of caster to the after end of the skeg, as shown in Fig. 1. It makes but little resistance in rowing through the water, but enables one man to take hold of the bow and walk up the board runway as if the skeg were a wheelbarrow.

Small launches are hauled out by laying parallel boards on the beach, inserting rollers made by sawing some round spar into 2-ft. lengths. A spar about 4 in. in diameter will do, though one of 6 in. will work easier; or rollers of iron pipe will suffice.

A launch 30 ft. and upwards becomes too heavy to haul on rollers, and must be handled on grease. This requires heavier stringers than a plank, says the Motor Boat, from which this article is condensed.

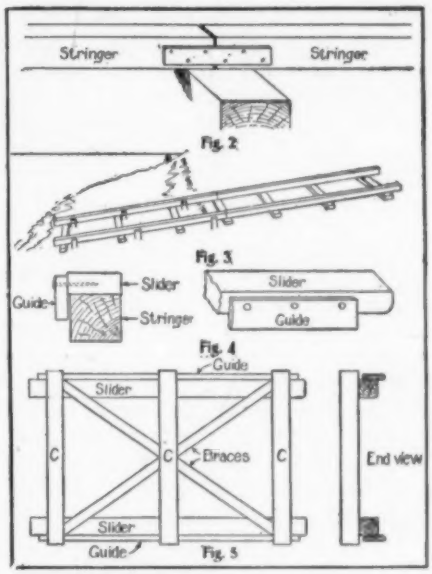
Get four pieces of 6 by 6-in. spruce or yellow pine; the former is preferable, as it is far lighter to lug about, though the latter is better if they are to be left down for steady use as stringers. The longer they are the better, as there will be fewer joints to go over and get out of line. Where you join the two lengths of stringers be sure the two ends are on the same blocking, as shown in Fig. 2. Two edges of each stringer should be planed up smooth. Lay them so one edge is up, the other on the outer edge, and measure with a stick so as to get the two parallel.

This forms the foundation or track to haul on, and is all one needs in tidal waters, as one length can be laid at low tide and held from floating away by being nailed to stakes driven down into the sand or mud bottom at intervals along each side of the stringers, as shown in Fig. 3. For fresh water, where there is no perceptible rise or fall in the water level, it is necessary to board across on the lower edge of

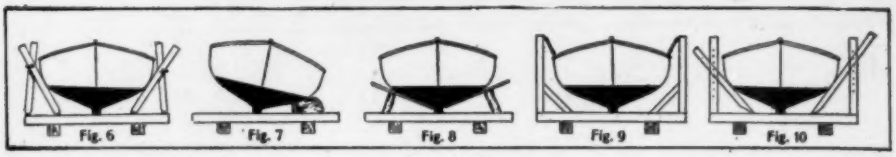
Fig. 1

the stringers at each end, particularly the outer end, as that has to sink the most. By piling rocks on these boards after floating it so the outer end is in deep water, it can be sunk into place.

The sliders or cradle to hold the yacht is now to be made. For this get two pieces of 4 by 6-in. spruce, 8 to 10 ft. long, planed upon one side, with the ends slightly rounded like a runner on a sled. To keep these sliders from slipping off the stringers, get some 2 by 6-in. yellow pine or oak, about as long as the sliders, and bolt them so



they lap down about 2 in. below the sliders, as shown in Fig. 4. Then lay the two sliders the proper distance apart, about 6 ft. for a 30 to 40-ft.



launch, wider, of course, for larger boats, and within a foot or so of each end lay a cross-piece, C, Fig. 5, of 6 by 6-in. oak or yellow pine, and through-bolt them to the fore and aft sliders with two bolts of about ½-in. iron; countersink the heads well into the under side of the sliders, so they will not scratch.

If the launch is very heavy, any number of extra cross-pieces can be laid across to carry her; but be sure and toe-nail them down or they will float away when in the water.

To prevent this cradle from shutting up like a parallel rule, cut two diagonal braces forming an X of, say, 3 by 6-in. spruce, and spike them fast to the sliders as shown in Fig. 5.

To haul this cradle a temporary arrangement can be made by simply making a long loop in the ends of a good piece of 1-in. rope and hooking them over the outer ends of the fore and aft sliders. A wire nail or two will hold them in place there. Several methods are used to increase a man's power to haul this cradle with a launch on it. If the beach is flat and not very much slope, three or four men can move the cradle and launch; but if there be a steep grade, greater power is needed. This can be supplied either by a horse or by making a wooden "crab," as the trade calls it; the novice would probably call it a capstan or winch.

We now come to the various ways of putting and holding the launch on the cradle to prevent her falling over. Most launches have very shallow keels; they are nowhere near as difficult to block up as the deep, narrow-keeled sailboats.

With a great many launches all that is necessary is to float them on to the cradle and slip a block of wood under one side, letting them list or tip over on to that block, and straightening them up after they are high and dry as shown in Fig. 7. Another way is to slip a plank under each bilge and then jam in a brace under it, as in Fig. 8.

Cradles that are to be used repeatedly are sometimes fitted with regular sliding bilge blocks, or upright posts securely braced with tackles at the top to hold the boat as in Fig. 9; others have two slant arms pivoted to the middle cross-piece on the cradle like a pair of scissors, as in Fig. 6. In some the outer uprights are stationary and doubled, so the inner arms work up and down between them, as in Fig. 10. As soon as the launch is securely grounded on the cradle a bolt is slipped through holes in these arms so it holds the slanting arm up against the bilge. In others both arms pivot and accommodate any angle, being held by a boat-clamp when up against the hull.

REMEDY FOR A LEAKING FOUNTAIN PEN

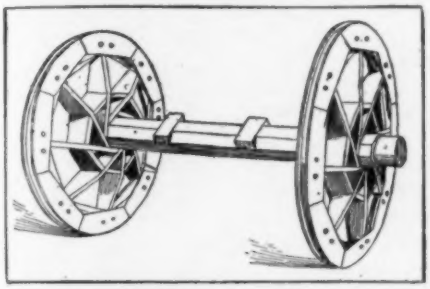
If the threads in the rubber connection of a fountain pen are worn a little the joint will leak enough to soil the fingers. Dry the threads with a blotter and cover them with melted paraffin. Turn the nozzle into the barrel while the paraffin is still warm and you have an ink-tight joint.—Contributed by Bruce W. David, Meadville, Pa.

Overheating of gas engine cylinders may be due to improper flow of water through the cylinder water jacket, to the water jacket having become coated with scale or to have an accumulation of dirt in it, says the Practical Engineer. The temperature of the outflowing water should not be greater than 140 deg.; some makers of gas engines advise that it should be as low as 100 to 120 deg. Fahrenheit.

SHOP NOTES

Home-Made Spool for Oil-Drilling Rig

A solid wooden shaft is made from a piece of timber about 14 in. square. This is trimmed in the shape of an octagon. This shaft is supported on axles

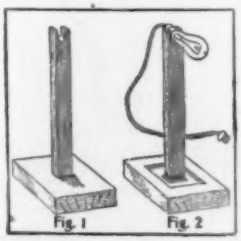


Oil Drillers' Spool

at the ends. The wheels are about 8 ft. in diameter and built up with spokes made from 2 by 12-in. planks nailed to the flat sides of the axle and braced by connecting pieces of the same material. The right-hand wheel is used to propel the spool, either by hand or with a rope drive from an engine. Pegs are inserted in the rim of the wheel to be used when operated by hand. A strap brake is placed on the other wheel.

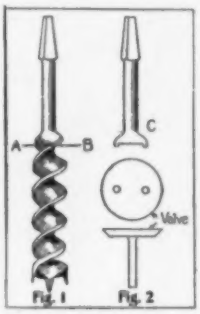
Home-Made Electric Light Stand

The accompanying sketch shows the construction of an electric light stand for the drawing table. A 6-in. square block is nailed to a 1 by 1½ by 12-in. strip of wood, which is notched at its upper end, as shown in Fig. 1. The square block may be hollowed out, as shown in Fig. 2, to receive tacks or instruments. The notch in the upper end of the strip is fitted to receive the electric socket.



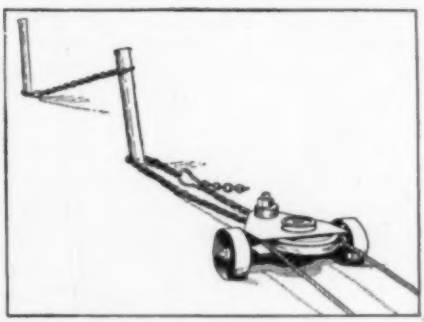
A Home-Made Tool for Grinding Valves

The valves in gasoline engines and automobile motors sometimes need to be ground so they will fit closely to their seats. A very handy tool for this purpose may be made by using a carpenter's old bit and bitstock. The bit is cut off on the line A-B, as shown in Fig. 1. The end of the remaining part is shaped as shown at C in Fig. 2. If there are no holes in the top of the valve, drill them as shown to fit the tool. A few turns with this tool, using a little fine emery on the valve seat, will make the valve fit closely.



How to Fasten a Dead Sheave Pulley

The accompanying sketch shows how to fasten, as well as the construction of,

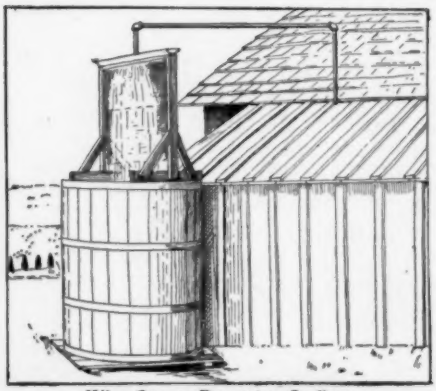


Dead Sheave Pulley Fastened

a dead sheave pulley for moving structures. The sheave pulley is mounted on two wheels for easy transportation, also to keep the cable from touching the ground when in operation. Two stakes fastened with chains as shown will hold it in position.

Cooling Water for a Large Gasoline Engine

A method of increasing the cooling capacity of a water tank in connection with a large gasoline engine is shown

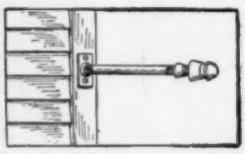


Wire Screen Promotes Cooling

in the accompanying sketch. Galvanized wire netting of about ¼-in. mesh is fastened to a frame above the tank. On top of this frame is a metal trough that receives the hot water coming from the engine through a pipe. The water spills from the trough on the wire netting, which causes it to spread and run down into the tank in a thin sheet. This greatly aids the cooling of the water.

Quickly Made Extension Insulator Arm

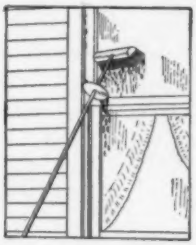
Sometimes it is necessary to use an extension for an insulator on buildings.



This may be made quickly by using a 1-in. waste nut into which is screwed a 1-in. pipe of the proper length. The wooden pin holding the insulator is turned to fit the end of the pipe. It is connected and fastened to the building, as shown in the sketch.—Contributed by George Thorpe, Jr., Millville, N. J.

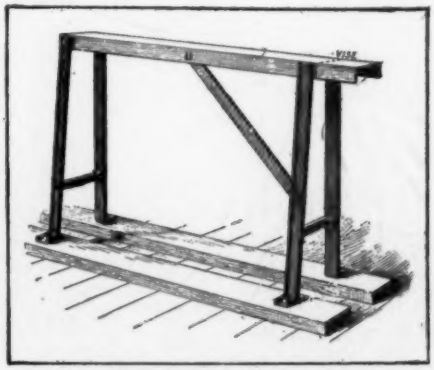
A Window Washing Kink

When washing windows it is very disagreeable to have the water run down the handle of the washing brush, on to the hands and into your sleeves. Cut a circle of leather from an old boot sole and slip it over the handle of the brush, as shown in the sketch. This will sidetrack the water at the point where the leather is placed.



A Pipe-Fitter's Knock-Down Bench

A form of knock-down bench suitable for the work of the steamfitter is illustrated in the accompanying sketch. The bench is comprised altogether of metal, in the form of channel irons. It is light and at the same time rigid. When partially taken apart it can be folded into little space, to be carried from or about a building, says the Metal Worker. The top of the bench is made from a channel 5 ft. long and 8 in.

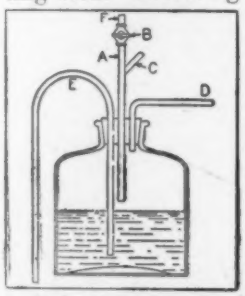


Knock-Down Bench of Channel Irons

wide, which is supported by legs of channel 3 ft. long. The two pairs of legs are bolted to two long planks, these being long enough to assist very materially in the stability of the bench. For general convenience the planks and the bench as a whole can be moved from place to place. When it is desired to carry the bench some distance it is only necessary to loosen the legs from the planks and turn them parallel with the large channel.

How to Make a Water Pressure Blowpipe

Secure a jar with a large tight-fitting cork. Referring to the sketch the



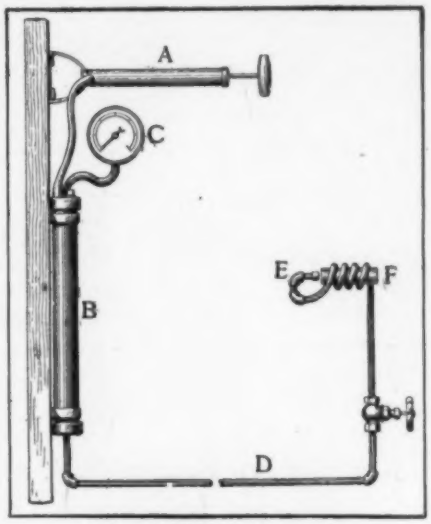
pipe F is connected to a tank or city water pressure. The open projecting pipe, C, allows the air to mingle with the water as it flows into the jar through the pipe A. The air as it is compressed will pass out of the tube D, which is connected to the blowpipe. The water is syphoned off through the pipe E. The valve B is used to regulate the flow of water.—Contributed by D. Jennings, Clear Lake, Iowa.

A Slipping Belt Starts a Flame

A peculiar incident occurred recently in a mill at Stockton, Utah. An ⅛-in. rubber belt, which had been frequently "doped" with cylinder oil to make it pull, became badly worn. It finally slipped on the pulley and the friction ignited the oil-soaked and frayed belt and it blazed and burned in two. It then wrapped itself around the shaft, and the whirling motion fanned the flame, which burned until it reached the part that was tightly wrapped to the shaft, where it burned out.

A Home-Made Brazing and Tempering Torch

All jobbing shops have a call at some time or other to do brazing and the forge fire is not the proper one to heat the parts to secure a first-class job. A torch using gasoline or kerosene will furnish a much better fire, and such a device can be constructed by anyone



Home-Made Brazing Torch

of mechanical ability. Make a tank, B, as shown in the illustration, by using a piece of 2-in. pipe 20 in. long and covering the ends with caps. Three holes are drilled in the top cap, to one of which the rubber tube from a bicycle pump is connected, a steam gauge, C, is attached to another, and the remaining one is fitted with a screw plug and used in filling the tank with fuel oil.

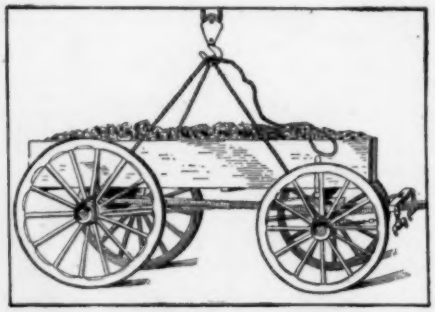
A hole is drilled in the bottom cap of the tank and connections are made with ¼-in. pipe, D, which may be of any length to suit the surroundings. About 10 in. of the end of this pipe is first filled with lead and coiled around a 1-in. pipe, F, 6 in. long, turning the end out so as to receive the two elbows and a short nipple. When the coil is finished the lead is melted and run out. A small hole is drilled in the center of an ¼-in. cap and placed on the end

of the pipe, as shown at E. The hole in this cap must correspond with the center of the pipe F. It is necessary to have a globe valve placed somewhere in the ⅛-in. pipe to regulate the flow of oil in the burner, and also shut it off when not in use. To generate it have a little cup or can of some kind that will hold three or four teaspoonfuls of oil and fix it to hang just below the coil while burning.

If one burner is not sufficient to heat the work two may be connected on the same pipe with a tee, so they will throw their blasts together.

How to Remove Dirt from Excavations

A contractor who is excavating the cellar for a new skyscraper in Chicago has hit upon a method of avoiding the expense and effort of removing excavated material by mule power. It is as simple as it is effective, and, of course, the wonder is that no one thought of it before.

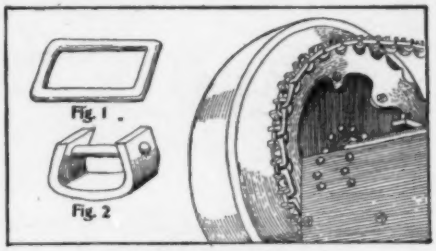


Removing Dirt from Excavations

The usual way is to build an inclined roadway into the hole, up which small loads of dirt are dragged by double teams. The new method avoids all this by lifting the loaded wagon bodily out of the excavation by means of a derrick and four looped cables, as shown in the illustration. Each loop is passed between the wagon body and one of the wheels, between the spokes and over the end of the hub. When each loop is securely in place the signal is given to hoist away, and in a few seconds the whole outfit—2 cu. yd. of earth and a big wagon—is lifted up through the air and swings to the brink 20 ft. above. A team is waiting to be hitched on and draw the load away to the dump.

How to Make a Heavy Drive Chain

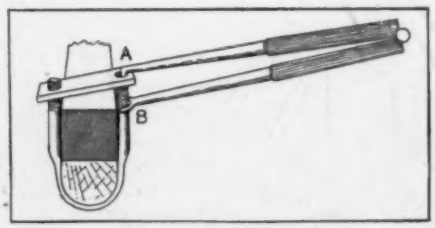
The accompanying illustration shows the construction of the parts to make a heavy chain that will not break. One part of the link is made from ¾-in. round iron and formed as shown in Fig. 1. The other part is made in the shape of a U from ⅝ by 2½-in. wrought iron with a hole drilled through the upper ends. After placing the links together to form the chain a pin is inserted in the holes drilled through the U-shaped piece and riveted.



Making Heavy Chain

A Tool for Placing Axle Clips

The device is made by using the joints from an old buggy top. A hook, A, is made on one end and a fork, B, on the other. When closed the hook should center in the fork. To place the clip in position the device is applied as shown in the sketch.—Contributed by P. E. Bolstad, Lake Mills, Iowa.



For Placing Axle Clips

A Folding Carpenter's Horse

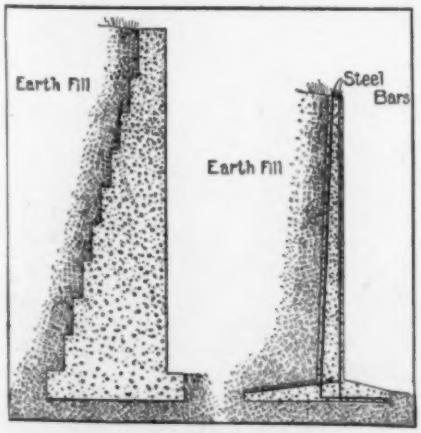
Not only when doing little jobs of carpentering, but also in many other operations, such a support as illustrated is found necessary. This horse is an improvement over the ordinary stiff affair in that it shuts together when not in use, and so can be packed out of the way, says a writer in New England Homestead.

The horse is made of boards cut in strips, the two horizontal boards at the top being hinged together. While in use the legs are kept apart by a long hook, as shown in the sketch.

Cost Reduced in Building Concrete Walls

In some cities the engineering problem of retaining and area walls to support and hold back earth banks is of more than passing interest. Concrete is the most suitable material for the construction of such walls and the accompanying cut shows two styles of design, the ordinary plan and the reinforced wall. The reinforced construction is coming into general use on account of its strength and economy.

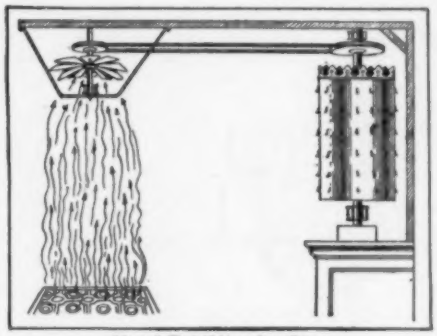
The sketch shows in cross section two walls of equal strength, while in walls less than 10 ft. in height economy would not be effected, but in those extending higher the saving is about 25 per cent, even when the steel bars and the richer mixture of concrete is taken into consideration. The reinforced wall here shown is held in place by the earth fill resting on the base projecting backwards into the filling. This assists very materially in preventing overturning or tipping of the wall. The face and back of the wall as well as the projecting base are tied together into one solid monolith by means of the embedded steel bars.



Area Wall Construction

How to Make a Goods Exhibitor

A practical tinner of a western city submits the accompanying sketch of a novel goods exhibitor for a hardware or other store which is simple in construction and ought to attract much attention, says the American Artisan. A tin drum 20 in. in diameter and 28 in. high, with some top ornamentation, is provided with a central shaft, a 2-in. wide pulley above and a couple of bicycle pedals attached, one each above and below. A fan wheel 20 in. in. diameter is then made and located above a furnace register, the fan having a 1½-in. band iron support from above, and a simple pulley, such as is used as a sash pulley, attached to shaft as shown. A light sewing machine belt is used to connect the pulleys. An upward flow of hot air from the register operates



Novel Exhibitor for Store

the whole device and causes the drum full of goods to revolve steadily and with good effect. It is an ingenious device and one that will attract much attention.

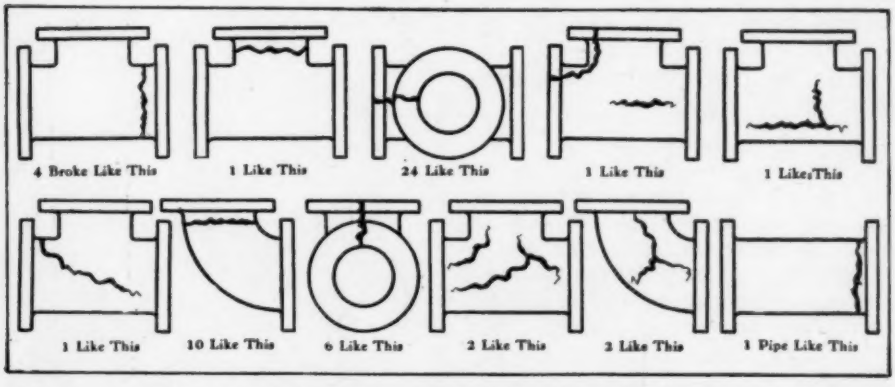
The Bursting Point of Flanged Fittings

Recently a number of tests were made on flanged fittings of the various sizes to determine the average point at which they would burst under hydraulic pressure. All tests were made by bolting blind flanges to the openings of the fittings and admitting water through a small opening in one flange, says the Valve World. Each fitting was cast with a key number for the purpose of identifying the date and heat for comparison with test bars run out of the same ladle. This gave a check against any fitting which might show strength or weakness beyond the average.

When making the fittings for these tests no particular care was exercised in the foundry, each piece being made in the regular way.

By using these destructive tests as a basis a rule was formulated which, when applied to flange fittings, can be used to determine the thickness of metal for a given pressure, or, the metal being known, to determine the pressure required to rupture. If the thickness of body metal is known, to determine the bursting point multiply the thickness of the metal by the per cent of tensile strength and divide by the inside diameter. The bursting point being given to determine the thickness of the metal, multiply the bursting point by the inside diameter and divide by the per cent of tensile strength. The percentage of tensile strength up to 12 in. in diameter is 65; for larger sizes use 60 per cent.

If the fittings are made of ferrosteel, 33,000 lb. per square inch may be taken as the tensile strength, and for cast-iron the tensile strength will average 22,000 lb. per square inch.



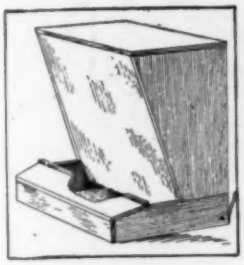
Of 52 fittings and one piece of pipe tested to the bursting point by hydraulic pressure, the results illustrated were obtained.

A Temporary Hose Substitute

A piece of ordinary hose was used to clean out the waste pipe in my sink when obstructed. One day the hose could not be found. For a substitute hose I used one made from newspapers. A quantity of the papers was wrapped around a broom handle, which formed a hollow tube when the handle was removed. One end of this tube was attached to the faucet and the other held over the outlet in the sink. A string was wrapped around the outside on each end and a few turns all along the space between. It served the purpose as well as the regular hose.—Contributed by Henry Bisbing, Trenton, N. J.

How to Make a Dry Food Hopper

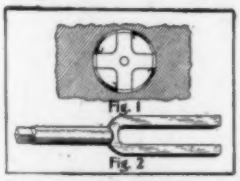
The accompanying sketch shows how to construct a dry food hopper from which fowls may feed but cannot stand in the food. The exact dimensions must be followed in order to get the real worth of it, says the Poultry Keeper. Ground feed or cracked grains work equally well in it.



The bottom or trough is made 7 in. high with the part projecting in front 9½ in. wide, while the length may be optional. A board 4½ in. wide is nailed on the front of the trough so it has a slant and dirt will work away from the opening. A ½-in. piece is fastened to the edge of this, as shown, which will greatly aid in keeping the dirt out. This will leave an opening 4½ in. wide across the front of the hopper, from which the fowls may feed. On the ends of the trough nail other boards and, extending above it so that the fowls must stand in front in order to get the food, which they can get by standing on the 4½-in. strip across the top of the trough.

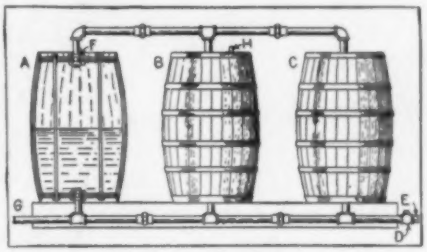
How to Remove a Broken Tap

A machine tap should never be rushed, and especially when taking a deep cut. Cutting threads in wrought iron, the metal will form as shown in Fig. 1. The tap will cut its entire length if it is turned back frequently to cut off this metal. Never turn a tap by one handle of the holder, as this will cause a side strain that often breaks it. If a tap is broken off flush with the work the broken part may be removed with a tool made as shown in Fig. 2. If it will not start, heat the work with a plumber's torch.—Contributed by Donald S. Stewart, Waynesburg, Pa.



Home-Made Pneumatic Water System

A party living some distance from a city wished to have a cheap water system for his buildings and grounds and he constructed a successful one, as shown in the accompanying sketch. Three barrels and a 20-gal. keg were secured. The keg was used for a hot water tank in the kitchen connected up in the same manner as connecting a range boiler. The three barrels were connected as shown by first removing



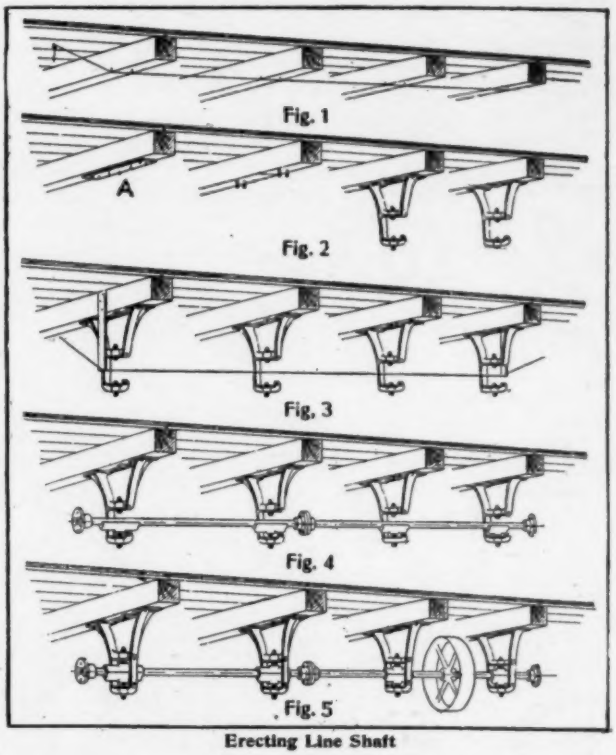
Pneumatic Water Supply

one head of each barrel in order to put lock nuts, F, on the pipe. After replacing the heads two ½-in. rods were run through each barrel, as shown at A, and a heavy washer placed on each end with the nuts so as to hold the pressure. The pipe E leads to a force pump at the well and a check valve is placed in this pipe at D to prevent the water being forced back into the pump. The pipe G connects with the house, chicken yards and the barn. A bicycle pump is used to supply the air pressure and is connected to a bicycle tire valve, which may be fastened in any one of the barrels, as shown at H. If all the connections are airtight it will require air filling only once a month. The water is pumped into the barrels by a force pump, which may be operated by hand or power.

How to Erect a Line Shaft

The first operation of erecting a line shaft is to lay off in some manner on the ceiling beams or hanger planks a line, Fig. 1, to represent the center line of the shaft, or, more properly, of the hanger feet directly above the shaft.

This line being marked plainly on the supporting beams or planks, the holes for lag screws or hanger bolts may be bored. The work is made easy and its accuracy insured by use of a templet board having holes to suit the hanger feet and marks to indicate the center line. Placing the templet board with its center line in proper register with the center line marked on the hanger beam and fastening it by partly-driven nails, A, Fig. 2, the bolt holes may be bored quickly and without laying out.



Erecting Line Shaft

Removing the templet by drawing the nails whose heads were left protruding, the hanger bolts may be inserted, as shown on the second beam in Fig. 2. On the third and fourth beams the hanger frames are up and held by the bolts, which should not yet be set up tight, says Power and Transmission. If lag screws are used, the hanger frame must be lifted and held while one or two screws are entered. The regular hanger bolt, with thread and nut where the lag screw has a head, is a much preferable thing for this work.

The hanger frames up, but without the bolts tight, they are ready for transverse alignment. To do this a line may be stretched in any convenient manner, Fig. 3, through the hanger jaws, to represent transversely the shaft center line, but lower, so as just to clear the bottom plunger screws, in hangers at mid-length of the sagging line. By screwing the lower plunger screw of each hanger frame—one frame at a time—up close to the line the alignment is readily observed. The hanger feet may be tapped with a hammer to move the frame either way, as is necessary to bring the center of the plunger screw directly underneath the line. When so placed the supporting bolts are set up, care being taken to see that such tightening does not alter the alignment. Then the plunger screws should be run down to fill the line perfectly, after which the operation of alignment may be repeated at the other hangers. When this work is done the transverse alignment of the shafting is assured, regardless of varying diameters.

Then the bases of the bearings may be placed on the lower plunger screws, either before or after the shaft is lifted into place, Fig. 4. With the bearing

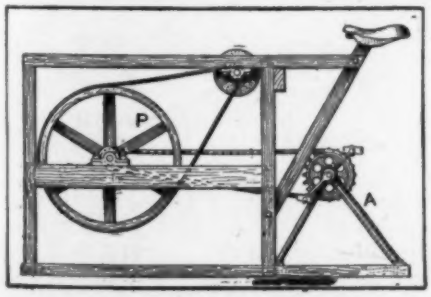
caps placed, Fig. 5, and the upper plungers screwed down, the line is ready for vertical alignment by adjustment of the plunger screws, as dictated by the use of a level along the shaft. With the four-way hanger the preparation of bolts to receive hanger is made in the same manner, but when it comes to bolting them up they must be put up as they are. The transverse alignment must be secured after the shaft is in place, using a line to one side, above or below the shaft. Measurements are made from the line to the shaft in this case.

A Simple Etching Fluid

Prepare a fluid by using powdered copperas and water, of which the quantity need not be more than a spoonful of each. Clean the part to be etched and, by warming it, apply a thin layer of beeswax. With a sharp-pointed instrument write the name or make the design desired through the beeswax coating and cover with fine table salt. Apply enough solution to the salt just to make it wet. Let it remain until dry and remove the beeswax with kerosene.—Contributed by Frank G. Lilja, Indian Orchard, Mass.

Home-Made Foot Power Emery Wheel

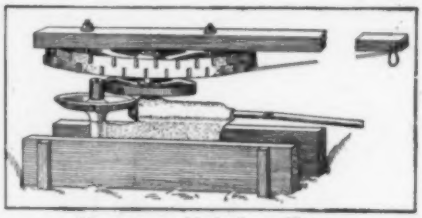
The accompanying sketch shows the design and construction of an emery wheel stand made by a correspondent of the Blacksmith and Wheelwright. The belt wheel, P, is 26 in. in diameter with a 2-in. face and is lined up with a 2-in. pulley on the emery wheel shaft.



A part of an old bicycle frame that contains the hanger is used as the propelling device. It is attached to the stand, as shown at A. Two bicycle chains will connect the bicycle sprocket to the shaft on which is placed the large pulley wheel, P. The upright pieces of the stand are 2 by 2-in., and the top and middle rail are 2 by 4-in. material. The frame is 8-in. wide and is mounted on a 2 by 12-in. plank. The saddle of the bicycle is used for a seat.

Converting a Mower Into a Horsepower

A horsepower which may be used for light work about the shop or farm may be made from an old mower. Remove the drive wheel from the opposite side



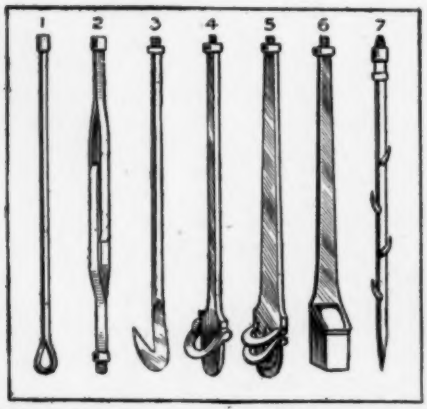
Horsepower Made from Mower

that contains the gearing. Turn the frame of the machine on its side so the main wheel shaft stands vertical and bolt it between two 2-in. planks about 8 ft. long, to which are bolted stakes that have been driven in the ground. Take the tongue of the mower and clamp or bolt it to the drive wheel. A truss rod should be fastened to the outer surface of the wheel and to the end of the tongue.

Gas pipe is used for a tumbling rod which is slipped over the end of the pitman shaft after the wheel has been removed. A hole is drilled through both the gas pipe and the shaft and a pin fitted loosely so the pipe may work at an angle. The gearing is ready for action and will need no remodeling. The ratchet is left in the wheel so, when connected with machinery having a heavy flywheel, the horses may be stopped and the machinery run loosely without interfering with the sweep.

Fishing Tools Used in Drilling Wells

When drilling tools become fast in a well these tools are used to cut the rope and fish them out so that work can be



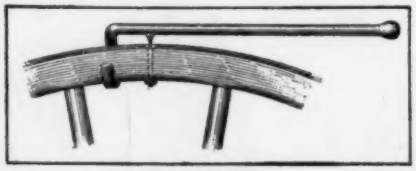
1—Rope Knife Sinker 2—Rope Knife Jars 3—Hook Rope Knife 4—Horseshoe Rope Knife 5—Trip Rope Knife 6—Valve Rope Knife 7—Rope Spear

continued. The rope knives here shown are used in cutting the drill rope when it is necessary to get hold of a drill with a slip socket. They can be used on a string of sucker rods, pipe or sand line. When the latter is used the sinker and jars are necessary. The "trip rope knife" is best, because, when the trip is set, the rope cannot be cut until the knife strikes the rope socket.

The rope spears are used to take hold of a broken cable or rope. They are generally used with the jars and sinker, the sinker being placed above the jars in order to give weight enough to force the spear deep into the rope.

Another Tire Bolt Holder

The accompanying sketch shows how an ingenious device was constructed by a correspondent of the Blacksmith and

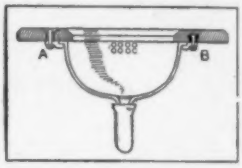


Tire Bolt Holder

Wheelwright to hold a tire bolt while turning the nut. This is made of $\frac{5}{8}$-in. soft steel with a hard steel point inserted $2\frac{1}{2}$ in. from the hook end to hold the bolt. It is about 18 in. long when finished.

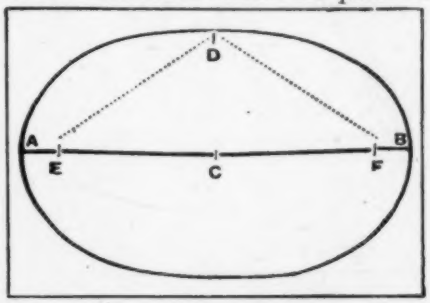
Fastening Clamp Bolts on a Lavatory

A basin of a lavatory is held up by three or four clamps fastened to the slab by bolts leaded into holes drilled in part way, as shown at B in the sketch. When these bolts loosen and come out it is hard for the repairman to lead them again so they will hold. To make a good holdfast job drill the hole through the slab as shown at A, countersinking the top for the head of the bolt. After the bolt is put in place the hole is filled with plaster.



How to Draw an Oval

Draw a horizontal line the length of the desired oval and mark the ends A and B. Bisect and mark the point C.



Drawing an Oval

From C draw a vertical line one-half the width of the desired oval and designate the end of this line D. Measure from this point D a distance equal to one-half the length of the oval, or the distance from A to C, back to the horizontal line between A and C and mark this point E. Do likewise from D to

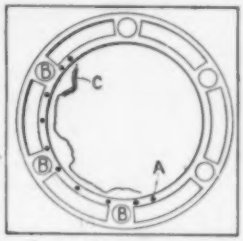
the line between C and B and mark the point F. Drive pins in these points E and F. If working on marble or other material where the pins cannot be driven, put a drop of hot sealing wax on the place where the pin is to be stuck, says the Monumental News. The wax will secure the pin for making the oval and can be removed without damage to the stone or other material. A small loop is made in each end of a thread to be placed over the pins E and F. This thread must be the exact length from A to B. By using a pencil point stretch the string tight on both pins, making it take the position as shown by the dotted lines. Draw a line from A, crossing D, to B. This forms half of the oval. Repeat the operation for the other side.

A Boiler Blow-Off Recording Device

The accompanying sketch will almost explain itself. By attaching a small water wheel on the blow-off pipe by means of two tees, with branches at angles of 45 deg., and by directly connecting a common bicycle speedometer to the shaft of the water wheel a reading will be obtained from time to time as the boiler is blown down. A little experimenting will enable one to learn readily the approximate amount blown down by subtracting the last reading from the preceding one, says a correspondent in Power. For instance, if while blowing down 5 in. of water the speedometer has run from 100 to 700 it will indicate that the speedometer has to swell its figure by 600 in order to lower the boiler level 5 in.

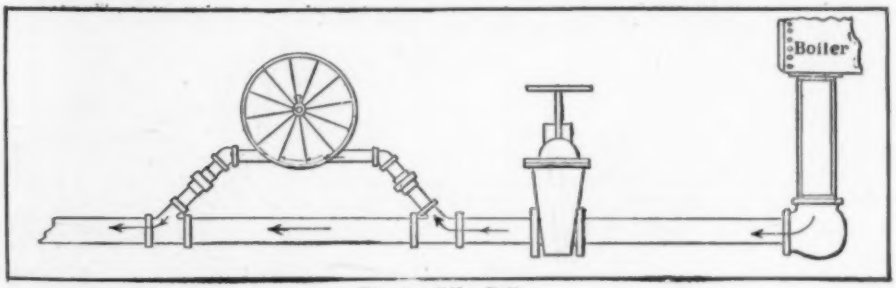
Repairing a Cracked Cylinder

The sketch shows a gas engine cylinder that was cracked by lighting gas under the water jacket to remove the frost. The repair was made by putting stay bolts in the end of the cylinder with countersunk heads, as shown at A, and long bolts running through the water jacket as shown at B, says a correspondent in Gas Power. The crack in the cylinder was closed by drilling, tapping and putting in soft iron plugs, as shown at C, allowing enough room to head them over, then filing and scraping to make smooth enough for the piston to pass over the crack.



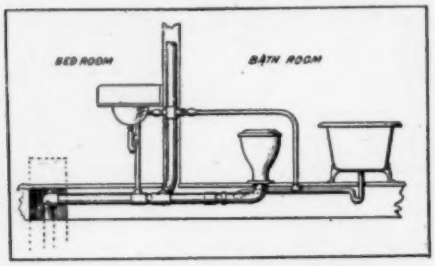
Size of Soil-Pipe for Dwelling Houses

The reason for the general retention of the 4-in. soil pipe stack as the basis for small residence installations is that the plumbing laws in many cities have named that size as the arbitrary standard for a water-closet connection. Naturally a small city or town contemplating the framing of a sanitary code makes inquiry into the plumbing laws and procedure in larger and healthier cities. The surrounding villages and towns emulate the neighboring cities in



Blowing Off a Boiler

the endeavor to get what is considered the best. The result has been the al-



Satisfactory 3-in. Soil Pipe System

most general acceptance of the 4-in. size as the only proper size for a water-closet connection.

Some time ago a person wanted advice regarding the placing of a bathroom next to a front bedroom and over an alcove in the parlor. There was a 4-in. stud partition available for a soil stack, and the owner positively refused to allow the marring of the finish in the parlor in any way. After some consideration and a talk with the plumbing inspector it was decided to use a 3-in. wrought pipe in the partition and to connect it at the bottom with a 3-in. cast-iron soil pipe, which was in turn connected to the 4-in. house drain. The customer had misgivings and raised objections on account of the novelty of the thing. The job has been doing excellent service for a number of years, says a correspondent of the Metal Worker. Other jobs of that character have since been installed where allowable. In one case the 3-in. pipe runs horizontally 14 ft. before entering the soil stack.

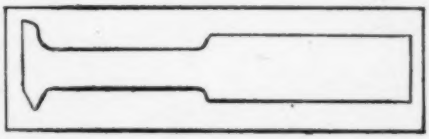
Stopping a Leak in a Gas Hose

Recently the gase hose connecting a hot plate sprung a leak and by applying a lighted match the seam was found to be about 3 in. in length. The repair was made quite easily by applying two or three coats of shellac varnish.—Contributed by A. W. Graham, Chicago.

Combined Boring and Threading Tool

The illustration shows a combination boring and threading tool that may be used to good advantage on some kinds of work, says American Machinist.

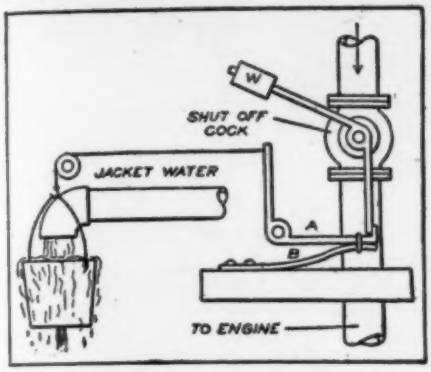
The back part of the tool, of which the sketch is the top view, is ground to be used as a boring tool with the lathe running backward, and the front part for threading. If a number of articles are to be bored and threaded by using a common lathe it is necessary to have two tools and make two settings for each piece, and caliper the thread and hole for each one chased and bored. Two stops are used for the tool slide, one in the back and one in the front.



This makes it only necessary to be sure the first is right and the others will be duplicates. The stop for boring was made so it would swing back; when the hole is bored to size, it is undercut at the back to allow the thread to run out. This tool is especially adapted to brass work.

Automatic Shut-Off for a Gas Engine

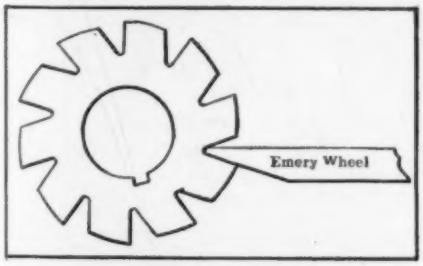
A simple device for shutting down the gas engine when the jacket water supplied to the cylinder fails to flow is described by the Engineer. The jacket water is discharged through a pipe outdoors and the stream from this pipe is caught in a bucket which is suspended by a cord passing over a pulley. The bottom of the bucket is pierced by a hole which is about ¼ in. in diameter. So long as the water discharges from the jacket the bucket will be kept full and running over. If the flow of water ceases the bucket will empty through



the small hole in the bottom and the catch, A, will be thrown downward by the spring, B, allowing the weight, W, to fall and close the shut-off cock.

How to Grind Formed Cutters

The usual method of grinding formed cutters is to use the flat side of the emery wheel. If the operator will true the beveled side of the wheel so as to make it perfectly straight and then adjust his machine so as to bring this beveled side radial with the center of the cutter he will not be half so liable to draw the temper of the teeth and will get his cutter ground in less than half the time taken if the flat side of the wheel has been used, says the American Machinist. The sketch will explain itself.

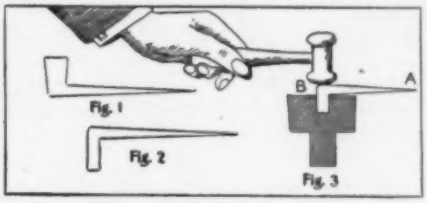


Grinding Formed Cutters

To use the flat side of the emery wheel in grinding the wheel soon becomes glazed and heats the edges of the cutter very quickly, leaving the extreme cutting edge so soft that it will make only a few cuts before it needs grinding again.

Home-Made Jewelers' Riveting Tool

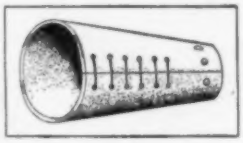
"I have been using a home-made tool for many years and I never saw one like it," says a correspondent of the Keystone. It is a jeweler's riveting tool made from a common heavy wall hook, as shown in Fig. 1, with the hook cut off and bent as shown in Fig. 2, leaving the horizontal bar about 3 in. in length. The vertical drop end is screwed tightly into a vise, as shown in Fig. 3, leaving the horizontal bar about ¼ in. above the edge of the vise. When struck with a hammer at the end, B, it exerts great riveting power upon anything held at the point A, such, for instance, as a watch chain swivel.



Jewelers' Riveting Device

Speed Indicator Attachment for Shafts Without Centers

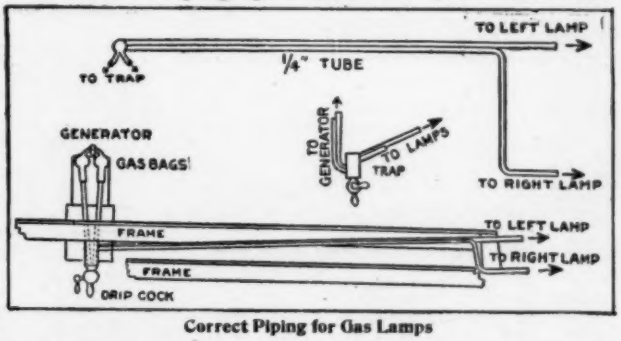
Occasionally shafts are cut off and used without centering holes drilled, which leaves no place to insert the square-pointed end of the indicator to obtain the speed. A little device can be made by using a common cork about 1½ in. in diameter on the large end and 1½ in. long, around which is placed a piece of 3-in. single-ply belting, cone-shaped, to fit over the end of the shaft and to receive the pointed end of the indicator. The belting is fastened to the cork with a few tacks and the edges held together by



wire lacing. The pointed end of the speed indicator is placed in the cork and the cupped end over the end of the shaft.

Correct Piping for Automobile Lamps

The cause of lights acting badly on automobiles is usually due to defective piping. Many of the complaints are traced to water collecting in the tubes and forming a trap through which the gas cannot pass freely. Where rubber tubing is used and connections made only when lamps are in use it is a nuisance when in a hurry, says Motor Age. The accompanying diagrams show a system that has been used with much success. Any repair man can make and install this at slight expense, being careful to have all pipes pitch down to drip-cocks. The pipe to each lamp should be independent, except at the trap, and gas from the generator should enter the trap below the piping to the lamps. The drip-cock should be opened at least once a week and the pipe should be fastened securely to the frame so as to prevent chafing.



Correct Piping for Gas Lamps

How to Repair a Cracked Water Jacket

A correspondent in Gas Power relates in the following how he repaired one of the worst cases of a cracked water jacket: "With a file we took off the edge or corner of the head and also the edge of the loose piece, which was entirely removed by the frost. Then we took a clamp and put the loose piece in its place in the head and held it there by clamping. We then used a $\frac{3}{16}$-in. iron drill and drilled three or four holes in the crack at different places and tapped a thread in these holes with a $\frac{1}{4}$-in. tap. In these holes we screwed in tightly $\frac{1}{4}$-in. plugs made from iron that was as soft as possible. They were then cut off close to the casting, leaving only enough metal to allow a little riveting. When the four plugs were in we riveted them with a light hammer and then took off the clamp. Holes were drilled all along the crack and plugs put in as before, and the whole crack was riveted over until all the different plugs looked like one piece. As the crack had been countersunk by filing off the top edge, the head was easily filed smooth, and after it was repainted no one could see where the crack had been except by taking off the head. It is sometimes necessary to hammer a little piece of copper wire into the crack which is left on the face of the head, so as to prevent leaking along the packing."

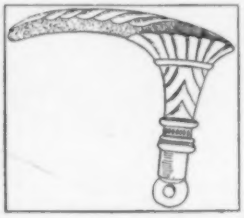
Double-Lipped Crucibles

The use of double-lipped graphite crucibles is looked upon with dislike by some brass foundries, while others continually use them. Opinions may differ, but there are many instances where the double-lipped crucibles are advantageous. Flasks may be poured more rapidly and with greater certainty, says the Brass World. The bench molder, for instance, has his flasks set upon a spill trough and the crucibles are carried between two rows of flasks. If a crucible with two lips is used, the flasks on one side of the trough are poured and the molder simply changes his own

position to the other side of the spill trough and the crucible, tongs and helpers remain in the same place to pour the other side. The crucible is ready for pouring on either side and the danger of disturbing the flasks is avoided. A double-lipped crucible costs no more and is always ready when wanted.

Making Umbrella Handles by Electro-Deposition

Umbrella, cane or parasol handles may be made successfully by the deposition of copper upon a soft metal model until a sufficient thickness has been obtained, and then melting out the model or core. A handle of copper sufficiently stiff for all purposes and very light is thus obtained. Patterns may be copied which could not be cast in soft metal or made from stamped shells. By soldering various soft metal parts together so that undercut designs are produced, exceedingly beautiful handles may be made. They could not be made of solid metal in any other manner, says the Brass World.



The method followed for the production of these handles is first to cast the pattern or model of any soft metal. A mixture of lead and antimony in the following proportions answers well and is used for this purpose: lead 87 lb., antimony 13 lb. If difficulty is experienced in running the mixture into the thin or difficult patterns, then a few pounds of tin may be added to each 100 lb. of the mixture.

An "ear" is cast on the model as shown in the sketch in order to allow for holding it in the solution while plating. After the casting has been made and the fins trimmed from it, it is cleaned in the lye kettle and immediately placed in the plating bath. The success of the whole operation depends upon a smooth copper deposit.

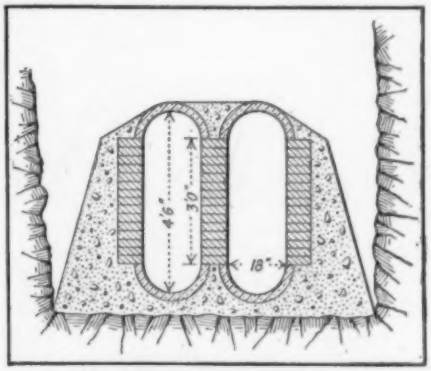
A Concrete Pipe Culvert

The accompanying sketch and following description of a double culvert appeared in Engineering News, and the culvert was constructed by George M. Cushing at Moca, Santo Domingo. The railway from Santiago to Moca is about 20 miles long and is not a difficult piece of construction. There are seven bridges of from 50-ft. to 75-ft. span and many large culverts. All of the culverts and bridge abutments have been built of concrete.

For pipe culverts cement pipe 18 in. in diameter, 3 ft. long and 3½ in. thick was made, using Portland cement and bank gravel. About 4,000 ft. were made.

The breakage of vitrified pipe is from 50 to 75 per cent on account of the many handlings and the crude manner of transportation after leaving the United States, so that the manufacture of these cement pipes made a great saving.

It was decided to make the 18-in. pipes in two parts, using one-half for invert and the other half for the arch. The side walls were built of brick. The native brick are of very poor quality and to strengthen them they were soaked in Portland cement grout. They were only used as a side lining and were built up first, taking the place of

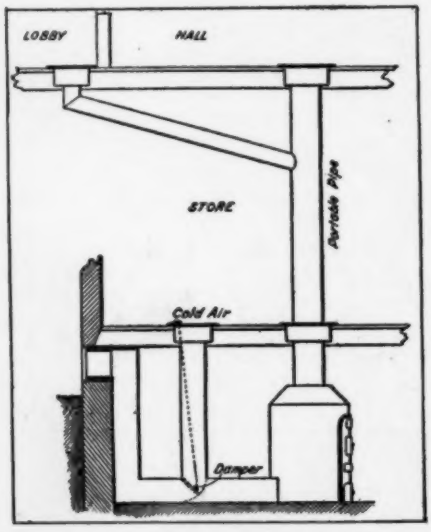


Cross Section of Concrete Culvert

lagging, the concrete being placed against it. This culvert is located between very high and steep banks some 35 ft. below the grade and is about 100 ft. long. The retaining walls at each end were laid in concrete against a brick facing, the brick being treated as in the side lining.

Heating an Amusement Hall with a Portable Pipe

In a certain place where an amusement hall was above a large storeroom, and when laying plans for heating, the question arose how to heat the hall? A suggestion was made by a correspondent of the Metal Worker to place the furnace in the cellar as near the middle of the store as possible and run a 16 or 18-in. pipe up to a 20 by 24-in. register in the floor. Then place in the floor of the hall, immediately above, a register of the same size, arranging on the ceiling below for an opening which will accommodate a round pipe of the same size as comes from the heater. This pipe can be stowed in any convenient place in the store until it is needed, and then by pushing it up to the opening left in the ceiling of the store it will make a direct connection with the hall register when it sets on the register in the first floor without making any tighter connection at the bottom than suggested. If it is also desirable to heat the lobby it is a simple matter to carry a 9 or 10-in. branch from this vertical pipe over to the lobby and connect with a smaller opening under the register in the lobby.

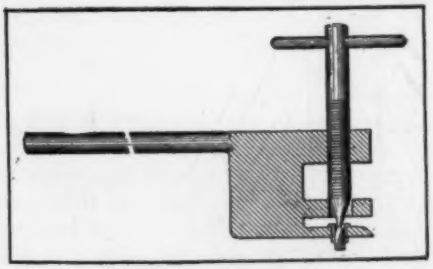


Heating Amusement Hall

If the furnace is to heat the hall occupied by people the air supply should be taken from the outside, though this may not be necessary for heating the store, which will be occupied by few people, and which will have the air changed frequently by the opening and closing of doors, and arrangements can be made to take the air supply to the furnace from the store floor when the hall is not occupied. A combination supply duct with suitable damper, as shown in the sketch, will dispose of the air supply question.

Tool for Removing Gauge Indicators

Some engineers may have experienced difficulty in removing the indicating needle, or pointer, from a steam gauge. A tool may be made from a piece of bronze, as shown in the sketch, which will be more efficient than a screwdriver, says a correspondent in Power. A $\frac{3}{16}$-in. hole is drilled in the topmost tongue and tapped for a $\frac{1}{4}$-in. screw. The bottom tongue is slipped under the pointer, the end of the screw placed over the point of the pin, and the screw turned. This will remove the pointer without trouble.



Removing Hands on a Gauge

Amateur Mechanics

Photographs in Relief Easily Made

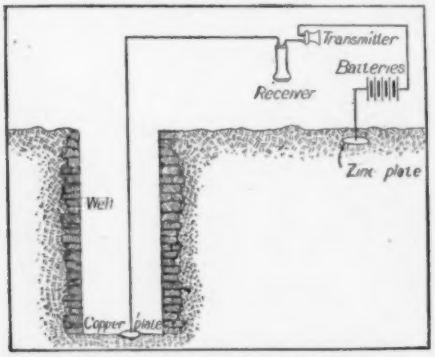
Reproduced from a Relief Photograph

Relief photographs, although apparently a difficult operation, can be made by any amateur photographer. The negative is made in the usual way and when ready for printing a positive or transparency is made from it in the same manner as a lantern slide or window transparency, says the Sketch, London. Use the same size plate as the negative for the transparency. To make the print in relief place the positive in the frame first with the film side out and the negative on top of this with the film side up in the usual manner. Put in the paper and print. This will require a greater length of time than

with the ordinary negative on account of printing through double glass and films. In using printing out papers care should be taken to place the printing frame in the same position and angle after each examination. The print is treated as any ordinary print.

How to Make a Wireless Telephone

A noted French scientist, Bourbouze, was able to keep up communications with the outside during the siege of Paris by making practical application of the earth-currents. The distance



Details of Wireless 'Phone Installation

covered is said to have been about 30 miles. Another scientist was able to telephone through the earth without the aid of wires. Nothing, however, has been made public as to how this was accomplished.

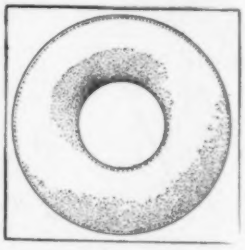
It is my object to unveil the mystery and to render this field accessible to others, at least to a certain degree, for I have by no means completed my researches in this particular work.

In order to establish a wireless communication between two points we need first of all a hole or well in the ground at each point. In my experiments I was unable to get a deep well, but the instruments worked fine for a distance of 200 ft. using wells about 25 ft. deep. As in ordinary telephone lines, we require a transmitter and receiver at each point. These must be of the long-distance type. If a hole is dug or a well is found suitable for the purpose, a copper wire is hung in the opening, allowing the end to touch the bottom. To make the proper contact an oval or round—but not pointed—copper plate is attached to the end of the wire. If a well is used it is necessary to have a waterproof cable for the part running through the water. The top end is attached to the telephone transmitter and receiver, as in the ordinary telephone, to the batteries and to a zinc plate which is to be buried in the earth a few feet away from the well or hole, and should not be more than 1 ft. under the surface. Four cells of dry batteries are used at each station.

Both stations are connected in the same way as shown in the sketch. This makes it possible for neighbors to use their wells as a means of communication with each other.—Contributed by A. E. Joeren.

How to Make a Life Buoy

Any boy may be able to make for himself or friends a life buoy for emergency use in a rowboat or for learning to swim. Purchase 1¾ yd. of 30-in. canvas and cut two circular pieces 30 in. in diameter, also cutting a round hole in the center of them 14 in. in diameter. These two pieces are sewed together on the outer and inner edges, leaving a space about 12 in. in length unsewed on the outer seam. Secure some of the cork used in packing Malaga grapes from a grocery or confectionery store and pack it into the pocket formed between the seams through the hole left in the outer edge. When packed full and tight sew up the remaining space in the seam. Paint the outside surface and the seams well with white paint to make it watertight. —Contributed by Will Hare, Petrolea, Ont.

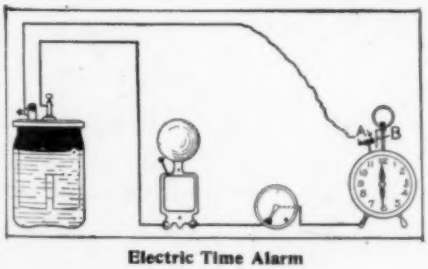


A Home-Made Microscope

A great many times we would like to examine a seed, an insect or the fiber of a piece of wood but have no magnifier handy. A very good microscope may be made out of the bulb of a broken thermometer. Empty out the mercury, which is easily done by holding the bulb with the stem down over a lamp or candle. A spirit lamp is the best, as it makes no smoke and gives a steady heat. Warm the bulb slowly and the mercury will be expelled and may be caught in a tea cup. Do not heat too fast, or the pressure of the mercury vapor may burst the glass bulb, cautions the Woodworkers' Review. To fill the bulb with water warm it and immerse the end of the tube in the water. Then allow it to cool and the pressure of the air will force the water into the bulb. Then boil the water gently, holding the bulb with the stem up; this will drive out all the air, and by turning the stem or tube down and placing the end in water the bulb will be completely filled. It is surprising how much can be seen by means of such a simple apparatus.

A Novel Electric Time Alarm

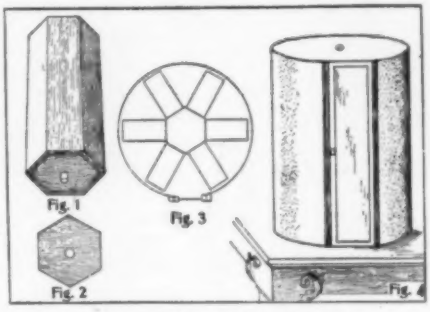
All time alarms run by clockwork must be wound and set each time. The accompanying diagram shows how to make the connection that will ring a bell by electric current at the time set without winding the alarm. The bell is removed from an ordinary alarm clock and a small metal strip attached, as shown at B. An insulated connection is fastened on the clapper of the bell, as shown at A. The arm holding the clapper must be bent to have the point A remain as close to the strip B as possible without touching it. The connection to the battery is made as shown. When the time set for the alarm comes the clapper will be moved far enough to make the contact. In the course of a minute the catch on the clapper arm will be released and the clapper will return to its former place.



Electric Time Alarm

How to Make a Phonograph Record Cabinet

The core, Fig. 1, consists of six strips of wood beveled so as to form six equal sides. The strips are 3 ft.



Phonograph Wax Record Case

long and 3 in. wide on the outside bevel and are nailed to three blocks made hexagon, as shown in Fig. 2, from $\frac{7}{8}$-in. material. One block is placed at each end and one in the middle. A $\frac{1}{2}$-in. metal pin is driven in a hole bored in the center of each end block. The bottoms of the pasteboard cases, used to hold the wax records, are either tacked or glued to this hexagon core, as shown in Fig. 3, with their open ends outward.

Two circular pieces are made of such a diameter as will cover the width of the core and the cases attached, and extend about $\frac{1}{2}$ in. each side. A $\frac{1}{2}$-in. hole is bored in the center of these pieces to receive the pins placed in the

ends of the core, Fig. 1. These will form the ends of the cabinet, and when placed, one on each end of the core, heavy building paper or sheet metal is tacked around them for a covering, as shown in Fig. 4. A small glass door is made, a little wider than one row of cases, and fitted in one side of the covering. The outside may be painted or decorated in any way to suit the builder.

Experiments with a Mirror

Ask your friend if he can decipher the sign as illustrated in the sketch, Fig. 1, which you pretend to have read over the shop of an Armenian shoemaker.

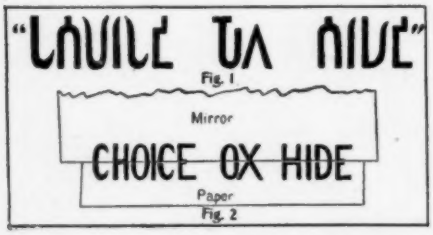


Fig. 1 Fig. 2

He will probably tell you that he is not conversant with Oriental languages. He will not believe it if you tell him it is written in good English, but place a frameless mirror perpendicularly on the mysterious script, right across the quotation marks, and it will appear as shown in Fig. 2. We understand at once that the reflected image is the faithful copy of the written half.

With the aid of a few books arrange the mirror and the paper as shown in Fig. 3 and ask your friend to write anything he chooses, with the condition that he shall see his hand and read the script in the mirror only. The writer will probably go no farther than the first letter. His hand seems to be struck with paralysis and unable to write anything but zigzags, says Scientific American.

Another experiment may be made by taking an egg shell and trimming it with the scissors so as to reduce it to a half shell. In the hollow bottom roughly draw with your pencil a cross with pointed ends. Bore a hole, about the size of a pea, in the center of the cross. Place yourself so as to face a window, the light falling upon your face, not upon the mirror which you hold in one hand. Close one eye. Place the shell between the other eye and the mirror, at a distance of 2 or 3 in. from either, the concavity facing the mirror as shown in Fig. 4. Through the hole in the shell look at the mirror as if it were some distant object. While you are so doing the concave shell will suddenly assume a strongly convex appearance. To destroy the illusion it becomes necessary either to open both eyes or to withdraw the shell away from the mirror. The nearer the shell to the mirror and the farther the eye from the shell the more readily comes the illusion.

Miniature Electric Lamps

After several years' research there has been produced a miniature electric bulb that is a great improvement and a decided departure from the old kind which used a carbon filament. A metallic filament prepared by a secret chemical process and suspended in the bulb in an S-shape is used instead of the old straight span. The voltage is gauged by the length of the span. The brilliancy of the filament excels anything of its length in any voltage.

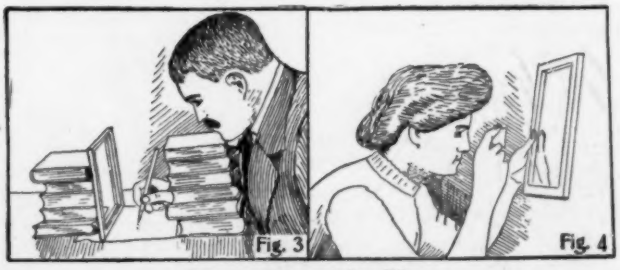
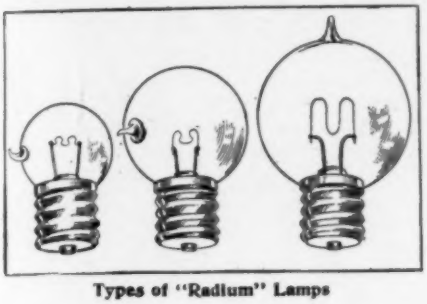


Fig. 3 Fig. 4

Experimenting with a Mirror

Of course, the filament is not made of the precious metal, radium; that simply being the trade name. However, the filament is composed of certain metals from which radium is extracted.

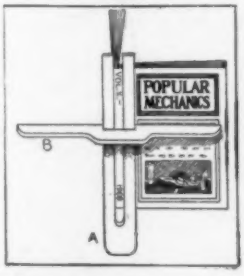


Types of "Radium" Lamps

The advantages of the new bulb are manifold. It gives five times the light on the same voltage and uses one-half of the current consumed by the old carbon filament. One of the disadvantages of the old style bulb was the glass tip, which made a shadow. This has been obviated in the radium bulb by blowing the tip on the side, as shown in the sketch, so as to produce no shadow.

How to Make a Magazine Clamp

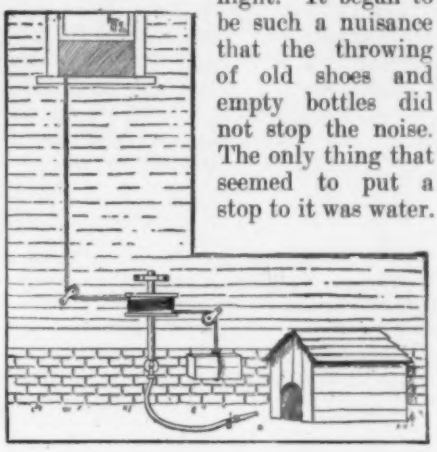
This device as shown in the illustration can be used to hold newspapers and magazines while reading. Two pieces of wood are cut as shown, one with a slot to fit over the back of a magazine and the other notched to serve as a clamp. The piece, A, may be slotted wide enough to insert two or three magazines and made long enough to hold several newspapers.



A color resembling pewter may be given to brass by boiling the castings in a cream of tartar solution containing a small amount of chloride of tin.

Drowning a Dog's Bark with Water

The owner of two dogs was very much annoyed by the dogs barking at night. It began to be such a nuisance that the throwing of old shoes and empty bottles did not stop the noise. The only thing that seemed to put a stop to it was water.



Water Treatment for Dog's Bark

Being on the third floor of the house, and a little too far from the kennel to throw the water effectively, a mechanism was arranged as shown in the sketch.

A faucet for the garden hose was directly below the window. An 8-in. wooden grooved pulley was slipped over an axle which had one end fitted on the handle of the faucet. A rope was extended to the window on the third floor and passed around the pulley several times, thence over an iron pulley fastened to the wall of the house and a weight was attached to its end. By pulling the rope up at the window the large pulley would turn on the water and when released the weight would shut off the flow. The nozzle was fastened so as to direct the stream where it would do the most good.—Contributed by A. S. Pennoyer, Berkeley, Cal.

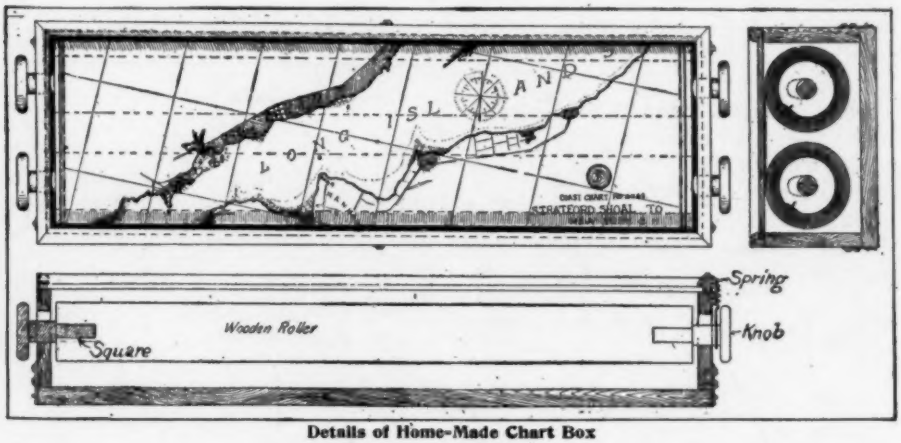
The average cost of supplying 1,000,000 gal. of water, based on the report of twenty-two cities, is $92. This sum includes operating expenses and interest on bonds.

How to Make a Chart Box

If you have had the experience of trying to hold a chart on a windy day, or in the rain, you will be able to appreciate the handy little contrivance here described. The device consists of a box about 3 ft. long, 1 ft. wide and 7 in. deep, with a plate-glass top, beneath which is fastened the chart, on two rollers, just as the film is placed on the rollers of a camera. On an extended cruise the charts may be pasted together before the start in one long strip, so that the charts may be rolled along continuously as the cruise progresses, and the particular part of the chart which is needed is always before the navigator's eyes.

The rolls may be made of almost any diameter, but a size of at least 2 in. will be found better than if the diameter be made as small, say, as an ordinary window-shade roller. This is because the paper of the charts is so stiff that it is liable to spring off the roller, if it be too small, where held by the thumbtacks.

The rollers are held in the box by round-ended knobs, with their ends stuck into the ends of the rollers. These knobs are used to turn the rolls in either direction, as may be necessary. In order to keep the chart taut under the glass, so that it can be read clearly, springs are fitted to hold the rolls up against the glass top, and this gives just enough friction, so that the rolls may be



Details of Home-Made Chart Box

New charts can be placed on the rollers at any time by taking out the rollers and attaching to them the new chart by the use of four ordinary thumbtacks, says Motor Boat. Then merely wind the chart on the rollers and place them back in the case.

To explain the method of construction, as illustrated, the sides of the box are ¾ in. thick. For a nice job use mahogany, but pine, cedar or any other wood will answer the purpose. The bottom is made of 1-in. material, and is made removable by being attached to the side with hooks and eyes or with any one of a dozen or more different styles of spring catches, such as those used in cameras.

turned easily, and still not be loose enough to let the charts unroll or sag. To provide evenness, as the charts increase in size on one roller and decrease on the other, the axle of the turning knobs must be put through oval-shaped holes or slots, so as to allow the rolls to move up and down.

The glass top is held by a rabbeted frame, set down over it and screwed or bradded fast to the sides. Scuppers should be cut through this frame to allow the water to run off the glass in wet weather.

This chart box can be built by any one possessed of a little ingenuity, and it will be found a very handy affair.